LX34(F8,3)
N52
3193

CFTRI-MYSORE
3193
Catering establi..

Central Food Tech. Res. Institute, Mysore.
Received for Review on 27.7.1955
from M/s. William Heinemann Ltd. London
Sl. No. 49

CATERING ESTABLISHMENTS AND THE PREVENTION OF FOOD POISONING

By the same Author :

FACTORY CANTEENS AND THEIR MANAGEMENT

MODERN ANGLING BIBLIOGRAPHY

HAMPTON ON PIKE FISHING

CATERING ESTABLISHMENTS AND THE PREVENTION OF FOOD POISONING

BY

JACK HAMPTON

Associate, Royal Sanitary Institute;
Member, Hotel and Catering Institute;
Catering Manager, Guest Keen & Nettlefolds (South Wales) Limited.

CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE
-9 SEP. 1955
LIBRARY
* MYSORE. *

LONDON
WILLIAM HEINEMANN
MEDICAL BOOKS · LTD
1952

First Published, 1952

This book is copyright. It may not be reproduced in whole or in part, nor may illustrations be copied for any purpose, without permission. Application with regard to copyright should be addressed to the Publishers.

3193.
G 508.
LX34, (F8.3)
N52

The Wh *nd Tonbridge*

CFTRI-MYSORE
3193
Catering establi..

INTRODUCTION

THE Public Health Laboratory Service investigated 964 outbreaks of food poisoning during 1949. The position was considerably worse than in previous years. The menace of tuberculosis, however, must be regarded as a crisis in our social history, as 38,648 people were being treated for this disease in hospital or were awaiting treatment. I have, therefore, dealt at considerable length with the dangers of cooking meat from animals suffering from tuberculosis.

I wish to thank:

Dr. A. J. G. Hood, Food Inspection Department, Montreal.

M. Russell, Esq., Chief Health Inspector, Capetown.

J. K. Menzies, Esq., Department of National Health, Ottawa.

The Department of Entomology, British Museum.

Dr. L. B. Pett, Nutrition Division, Ottawa.

F. Petitjean, Esq. Ministere du Travail, Bruxelles.

Leif Bruun, Esq., Social Department, Oslo.

Inge Seigs, Esq., Ministry of Labour, Oslo.

A. W. Fuchs, Esq., Division of Sanitation, Public Health Service, Washington, U.S.A.

for all their kind assistance.

In this country, for professional reasons, I am not permitted to thank publicly those T.B. specialists and Medical Officers of Health who have assisted me with this book. I am, however, most grateful to them and to those Sanitary Inspectors and Veterinary Surgeons without whose assistance it would never have been completed.

The Librarians of the Royal Sanitary Institute in London and the Public Health Service in Washington by their wide knowledge of the subject, greatly reduced my research by providing excellent reading lists.

I wish to thank the staff and my fellow lecturers of the Industrial Welfare Society and my former colleagues on the National Council of the Industrial Catering Association.

It is a great pleasure to acknowledge the kind assistance of my colleagues on the Advisory Committee of the Welsh School of Catering.

I am grateful to the British Broadcasting Corporation for allowing publication from my broadcast talks, and to the Editor of " The Times Review of Industry " for permission to quote from my published articles.

All expressions of opinion are purely personal to me and are not necessarily those of my employers, Guest, Keen & Nettlefolds (South Wales) Limited, the Industrial Welfare Society, the Industrial Catering Association or the Welsh School of Catering.

CONTENTS

CHAPTER		PAGE
I.	Food Poisoning	1
II.	The Quality of Beef	6
III.	The Quality of Mutton and Lamb	21
IV.	The Quality of Pork and Bacon	27
V.	Meat Inspection and the Diseases of Beef	33
VI.	The Changes in Meat After the Death of the Animal	51
VII.	The Effect of Cooking on Diseased Meat	56
VIII.	Poisonous Foods, Food Allergy and Fish Poisoning	59
IX.	Refrigeration and Storage	70
X.	Staff Hygiene	77
XI.	Buildings and Equipment	82
XII.	Botulism	100
XIII.	Salmonella Poisoning	102
XIV.	Staphylococcus Poisoning	105
XV.	Metallic Poisoning	108
XVI.	Rats and Mice	118

CHAPTER		PAGE
XVII.	Flies and Cockroaches . . .	126
XVIII.	The Law Relating to the Sale of Food	132
XIX.	Food Legislation Overseas . .	144
XX.	The Hygiene of Catering Establishments in the U.S.A., Canada, New Zealand, Australia, Norway and Sweden	154
XXI.	Future Food Legislation . .	166
BIBLIOGRAPHY	. . . . .	175
INDEX	. . . . .	186

CHAPTER 1

FOOD POISONING

It is extremely likely that many cases of minor food poisoning, occurring in private houses, go unreported every year. But woe betide the factory canteen or other catering establishment which has the misfortune to have a minor outbreak. Immediately the Press will give " banner " headlines to the matter.

In all cases of food poisoning it is likely that several persons at least will be affected following a specific meal for which they will blame a single item on the menu. When only one person in a group suffers gastro-intestinal symptoms, it is likely to be caused by disorder of one of the following: the gall-bladder, the renal passage, appendicitis or even some form of food allergy.

Some infectious diseases may have some of the symptoms of food poisoning and some confusion may arise in the minds of people who have had little experience of cases of food poisoning. The early stages of trichiniasis may be mistaken for food poisoning. Generally with food poisoning a number of persons are affected at one and the same time.

There are four types of food poisoning. The first is found with those foodstuffs which are in themselves wholesome but have been infected by poisonous bacteria or their toxins (the poisonous substances produced by some bacteria). The second type is where the food itself is poisonous as with certain types of toadstools, certain berries, rhubarb leaves and certain

poisonous plants, such as hemlock. The third type is associated with the poisonous conditions caused by eating food contaminated by certain metals, such as zinc and copper. The fourth type is when the food, as for example meat, is itself diseased with tuberculosis, trichiniasis, tape worms, etc. The first type can be avoided by a good standard of hygiene by food handlers and their equipment. The second, third and fourth types are largely questions of good management, particularly in regard to skilled purchasing. In recent years much attention has been paid to the first type, while unfortunately the other types have been largely neglected or ignored.

With most communal outbreaks, considerable attention has been paid to the probable cause, but in domestic cases, which despite statements to the contrary still form a most appreciable proportion of the total of annually notified cases of food poisoning, there seldom appears to be a proper investigation.

Liquid foods, such as milk and water, can carry the disease producing germs of scarlet fever, cholera, undulant fever, typhoid and paratyphoid. During 1944 in the United States there were four serious outbreaks of typhoid fever involving 350 people. Milk and milk products were suspected as the cause in all cases. Unfortunately it has not been possible to trace whether polluted water supply was the means by which the milk became infected. Tuberculosis may be contracted from an animal suffering from this disease, both from infected meat and infected milk.

The majority of recently reported cases have been from food poisoning of the first type. Most of the outbreaks of food poisoning occurring in recent years took

place in schools or hospitals. Details of the following cases have been reported:

June 8th, 1948. Certain schools in Yorkshire. Eighteen persons were affected by the outbreak but apparently the investigation was not very satisfactory.

September 20th, 1948. A sheep shearing company. This outbreak affected thirty-two persons, but at the enquiry no evidence was produced which proved conclusively that the outbreak was due to food poisoning. Wool sorting is a dangerous trade and the epidemic may have been due to causes other than food.

February, 1949. Lambs' tongues. Fifty persons.

April, 1949. A Boston school in which nine persons were affected by eating contaminated fish cakes.

April, 1949. A Manchester school outbreak. Although twenty persons were affected, the origin was not identified.

The heaviest outbreak during 1949 occurred in St. Bartholomew's Hospital, London, when 200 persons became ill.

During 1949 there were more than 11,000 cases of food poisoning in this country. School canteens had the worst record with 68 outbreaks, although hospitals with 44 outbreaks and restaurants with 35 outbreaks also showed up badly. Industrial canteens had 32 outbreaks which must be considered as much more favourable when it is remembered that they are serving almost sixty million meals weekly.

During 1950, hospitals and schools again compared badly with other types of catering establishments as these particularly severe outbreaks show :—

March, 1950. Minchendon Secondary School, Southgate, London. 150 children affected.

June, 1950. Four persons died from food poisoning at St. Luke's Hospital, Chelsea and two others died at Springfield Hospital, Tooting, where there were 51 other cases of food poisoning.

July, 1950. 474 cases of food poisoning in ten Surrey schools served from Chilworth Central Kitchen.

It is very widely held that there is more risk of infection from diseased or unsound meat than from any other cause. Fish, if unsound, is easily recognized, particularly after it has been cooked. Furthermore, fish is seldom diseased and therefore can only transmit disease by the first method.

Manufacturing-meat in recent years has been of such a doubtful quality that responsibility for it cannot be accepted. Unless therefore a catering manager has an extremely wide knowledge of meat inspection, he would be wise not to handle manufacturing quality meat or any cooked meat made from it.

It is a strange thing, but some people seem to forget that cleanliness costs money in a catering establishment or anywhere else. Canteen prices do not allow of any margin, and so in many of them even the elementary rules of hygiene are neglected in a vain attempt to keep costs down to a level of ridiculously low selling prices.

The chain stores in this country have set a high standard of hygiene in community feeding. Their

selling prices for meals, however, give a reasonable working margin for good management to have some scope. It might be as well to note the prices of one large chain store group in their cafeterias. These prices are obviously far more satisfactory than the average canteen, which sells a three-course meal for about one shilling and sixpence.

The transport of food often leaves a great deal to be desired. There are comparatively few catering establishments having control of their own vehicles. It is surprising that there have not been more cases of food poisoning caused by food, in transit, being contaminated with the remnants of previous loads, many of which may have been poisonous. Too often the common carrier appears to neglect even elementary precautions of hygiene.

In practically any town it will be noticed that the vans delivering meat from the central slaughterhouse to the local butchers are generally in a dirty condition. The wearing of white overalls, except by the large ice-cream firms, is not generally made compulsory by companies for their employees engaged in delivering food.

Food poisoning appears to be more dangerous for men than for women. During the ten years 1937 to 1946, 149 males died from various types of food poisoning compared to 97 females. It is apparent, from the published figures, that food poisoning is more dangerous to the very young and to the very old rather than to other age groups. It follows, therefore, that school feeding services and hospitals are danger spots, while the great number of old-age pensioners using British Restaurants undoubtedly presents a special problem.

CHAPTER II

THE QUALITY OF BEEF

FROM an experience of having visited a large number of catering establishments, it has been found too often that the person in charge has adopted the attitude: " whether the meat is diseased or not is a matter for the butcher. It is nothing to do with me." It is not possible to find a greater fallacy, as the caterer is solely responsible for the quality of the food which he provides and it is he who is legally liable in the event of someone getting poisoned.

There is such a thing as the " Warranty Defence "; but that only applies if the food is sold in its original condition, and no one is likely to start serving raw meat.

Quality of meat varies considerably with the various types of beef cattle. These are:

Bull	Entire male.
Cow	Female.
Beast, Steer, Bullock, Ox	These are all terms for the castrated male.
Heifer . . .	Virgin female.
Stag	Improperly castrated or castrated late in life.
Calf	Young bovine of either sex until six months old.
Bobbie Calf . .	A very young calf (from birth to fourteen days old).
Veal Calf . . .	Calf from fourteen days to six months.
Stirk	From six months to fifteen months.

Store	From fifteen months to two years (usually imported from Ireland to Scotland or England for fattening).
Baby Beef . . .	Intensively fed bovines. Fed from birth to ten to fifteen months, when the animal will weigh about 9 cwt. live weight.

Under the provisions of the Livestock (Sales) Order, 1949, the Ministry of Food is the sole purchaser of fat cattle in Great Britain. The prices for cattle are determined by the estimated killing out percentage irrespective of quality, which varies as follows:

Home Bred Steers and Heifers

	per cent.
Super Special . .	59 and over
Special . . .	58
A + ...	57
A	56
A —	55
B + ...	54
B	53
B —	52
C + ...	51
C	50

Home Bred Cow Heifers

Grade	Estimated Killing Out Percentage
Super Special . .	59 and over
Special . . .	58
A + ...	57
A	56
A —	55
B + ...	54
B	53
B —	52
C + ...	51
C	50

A cow heifer, on the Ministry of Food's grading, is a beast which has at least one milk tooth in the head and/or has not calved.

Fat Cows

Grade	Estimated Killing Out Percentage
Special	56 and over
A +	55
A	54
A —	53
B +	52
B	51
B —	50

Fat Bulls

Grade	Estimated Killing Out Percentage
Super special	58 and over
A +	57
A	56
A —	55
B +	54
B	53
B —	52
C +	51
C	50

It should be clearly understood that the above system of grading is for *live* animals. Any live animal which, in the opinion of the graders, is likely to kill out at less than 50 per cent. must be sent to the central slaughterhouse at owners' risk. This means that the animal is not purchased by the Ministry until it has been dressed and only then after the carcase has been very carefully examined. Price varies with grading and time of year, but the higher the grade the higher the price.

After slaughter the carcases are graded by the Ministry of Food graders into " A," " B " and " M " (Manufacturing). The grading system appears to be wrapped in mystery, as apart from the confusion because of the duplication of the letters " A " and " B," which mean quite a different thing when applied to *live* or *dead* cattle, there appears to be no written standards for quality. Worst of all, however, the Ministry of Food graders appear to take no notice whatever of the elementary standards of meat inspection. Meat from a carcase infected by tuberculosis can be and often is graded " A."

Rigor mortis (the setting of the meat) is affected by three main factors:

(*a*) The extent of exercise before slaughter.
(*b*) The general health of the animal.
(*c*) The temperature of the room in which the meat is allowed to cool.

Strangely enough, if the room is warm the meat will " set " more quickly than in a cold place. It has been suggested that meat cooling in a temperature of 68° F. will take twenty-four hours to set, but in a temperature of 100° F. it will set in eight hours.

A fevered carcase will take much longer to set than one from an animal in healthy condition. A fat carcase will take longer to set and will not set so well as that from a moderately nourished one. Too much water used during the dressing of the carcase will also delay the proper setting. But in any case, if the carcase does not set readily the meat will soon decompose. The smell of decomposing meat during cooking is unmistakable, and it could be overlooked only if there is a deliberate attempt to cover the smell with strong spices.

The quality of meat determines the palatability and the ease with which it may be prepared for human consumption.

Beef consists of four main grades:

(*a*) Beef or Ox Beef.
(*b*) Heifer Beef (practically never seen as beef in the United Kingdom to-day).
(*c*) Bull Beef.
(*d*) Cow Beef.

Quality in beef, however, involves matters also of age, feeding, dressing and condition. Prime beef should be marbled with fat, and is usually cherry red in colour; but care should be exercised in using the colour of meat as a guide to quality. Marbling is due to deposits of well-filled fat cells along the connective tissues and between the muscle fibres. The muscular tissue should be firm and well developed with an absolute minimum of strength in muscular fibre and connective tissue.

It is possible to estimate the age of a beef animal by the appearance of the meat and bone. In fact, the best guide is the appearance of the first five bones in the vertebræ. The extensions of these vertebræ at one year of age closely resemble cartilage. They are soft and white, whereas the adjoining bone, although still soft, is distinctly red in colour. Red centres of bone will appear in the cartilage when the animal is about two years old. At three years the cartilage will be greyish, while the bone structure will be more apparent. The tendency will continue by degrees until six years of age the cartilage will have completely changed to bone. Some authorities have suggested that the change in the structure occurs more rapidly in cows. This is apparently true without any exception as to breed.

In young animals the bones are soft, porous and almost blue in colour which, as the animal becomes older, changes to a hard flinty bone often showing considerable bleaching. The inner surface of the ribs in young animals has a pink appearance but in old animals it is dead white and shiny. A healthy carcase from a good animal has a well-fed appearance. The back will be covered with bright clean fat with a pale yellow colour. The flesh should be soft and silky to the touch, full of blood. When cut, the appearance should be bright cherry red. In old animals there will be little marbling.

Characteristics of Good Quality Home-killed Meat

Beef (from Ox carcase)

Carcase . Well nourished.

Fat. . Light biscuit colour equally distributed over carcase.

Flesh (*a*) Firm and resilient to the touch.

(*b*) Should not "pit."

(*c*) Should not crackle, as there ought not to be gas in the tissues.

(*d*) The meat should be moist but not wet.

(*e*) The "lean" meat should be bright cherry red on exposure.

(*f*) The fat should be distributed in the muscular tissues, *i.e.*, "marbled."

(*g*) Generally the vertebræ of home-killed cattle is chopped down.

Characteristics of Prime Quality Hindquarter:

(*a*) Roundness of the buttock.

(*b*) Short shank.

(*c*) Good kidney fat.

In other words, from a beast which is well developed with meat right down to the hocks.

Poor Quality Ox Hindquarter:

(*d*) Hollowness in the loin and rump.
(*e*) Thin appearance of the buttock.
(*f*) Lack of cod fat.

Prime ox beef is from castrated males between two and five years old. It is lighter in colour than bull beef and generally has better "marbling."

Bull beef in mature animals is very dark red in colour, but it will probably be brick red in young animals. It is mainly purchased by kosher butchers. There is an absence of fat and great development of the muscular tissue.

The forequarter of bull beef has a heavy dark-looking crest, while the meat carries much more lean than fat. Generally the fat of the bull is very white, while the buttock shows much greater development than in the ox. The flesh is very dark in colour and marbling is almost entirely absent. Meat from an old bull feels like indiarubber to the touch. In bulls the kidney fat is generally very small, whereas in the ox it is well developed.

Beef from cow carcase shows the following characteristics:

Muscular development	Weak.
Flesh	More red than ox.
Fat	Patchy and yellow.
Bones	Smaller than ox. White in colour and flinty in texture.
Udder tissue . .	Brown and spongy.

Before the 1939–45 war the Army did not purchase any cow beef, which was more than four years old, for the messing of troops. The upgrading of dairy herds has resulted, however, in large numbers of old dairy cows being killed for home consumption. Many of these animals, technically known as " reactors," were suffering from tuberculosis. In fact, it is probably true to say, as a generalization, that 30 per cent. of all cows in this country are suffering from tuberculosis. Ayrshire herds, however, are particularly clear from tuberculosis, but most other dairy herds are prone to the disease in old age.

In an old cow the neck is long and pointed, the shoulders prominent and the shin bone fine and pointed. The fat is generally very yellow in colour, while the bone shows out from the flesh very white and flint-like in appearance. The udder of an old cow is loose brown, spongy and pendulous, but it is usually removed before sale by the butchers.

The most prominent features of cow beef are the pronounced yellow colour of the fat and the prominent hip bones, while the lean meat of the cow is often dull in colour.

Beef from Jersey cattle has a fat with a definite yellow colour. Jersey cattle are mainly bred for the production of very high quality milk and cannot be considered a beef breed.

It is extremely difficult to differentiate between the forequarter of beef from a young well-fed ox and a young well-fed heifer, but it is really immaterial, as both produce good quality beef.

A side of English beef will weigh almost 300 lb., but many Argentine sides will average about 450 lb. An

average home-killed hindquarter will weigh about 160 lb. The percentage of bone if taken over the whole carcase will be about 18 per cent., but in some joints, of course, the percentage will be much higher.

The standard set by the South American exporters is undoubtedly very high. Unfortunately it is true to say that the standard of general average quality of South American chilled beef is far higher than the general average of our own home-killed. One certainly does not see anything like the same amount of tuberculosis in the carcases as in home-killed meat.

Formerly, chilled beef was only guaranteed to keep forty days from the day of slaughter. Improvements in controlling atmosphere, with 10 per cent. sulphur dioxide, in the ships has resulted in considerable improvement in the keeping time, which has now increased to seventy days from the day of slaughter.

A quarter of chilled beef is cold and moist to the touch. This moisture, known as "sweating," is sometimes accompanied by a rather fusty smell. A cut section of the meat will have a brick red appearance. The vertebræ of the spine are sawn through on all imported chilled and frozen meat, but on home-killed carcases they are always chopped down.

Chilled beef, mainly from Argentine, Brazil, Chile and Uruguay, is stored at about 29·5° F. Chilled beef is always imported divided into forequarters and hindquarters, in order to save space in the ships. The trade in chilled beef from Australia and New Zealand is still in the experimental stage, although both these Dominions send large quantities of frozen beef. The South American trade in chilled beef has been built up largely by crossing the Hereford with native cattle.

In recent years, however, large numbers of first-class Aberdeen Angus bulls have been imported, mainly by the Argentine breeders, in order to obtain an earlier maturing animal. After defrosting the exterior of the quarter has a rather "dull" appearance. Newly-cut portions of meat, on exposure, have a brick-red appearance and are soft to the touch. With defrosting there is considerable loss of blood, far more than from meat which has not been taken down lower than 40° F.

Frozen beef is transported at a temperature between 10° and 15° F. It is imported mainly from South America, Australia, New Zealand, and South Africa. Frozen beef is inferior in quality to chilled beef. The fat is a pale creamy colour and darkens to a pale yellow during defrosting. The flesh is of a medium red colour. The meat, when frozen, cannot be cut with a knife and any division which may be required in this state is always done with a saw.

Frozen meat, after being thawed out, will "pit" if pressed with the finger. This means the pressure exerted by one finger will form a depression and will not spring back naturally as in fresh meat. During defrosting the quarter will sweat considerably. After defrosting the fat will be discoloured by the blood which has run into it. Generally, the vertebræ of all imported carcases is sawn down; usually with three ribs on the hindquarter. On home-killed meat it is usual only to have one rib on the hindquarter.

Hindquarters and "crops" are exported to this country from Australia. A crop is a forequarter after the brisket, flank and shank have been removed. "Cropping" is carried out in accordance with the Australian Government Export Regulations. There

are two Australian Government export qualities: Good Average Quality and Fair Average Quality. These are generally referred to as "G.A.Q." and "F.A.Q." The grading is carried out by the meat works and not by Government inspectors. Before the 1939–45 war Fair Average Quality Australian beef was not accepted by the British Army authorities for consumption by the troops.

The brisket is removed from the forequarter of Australian beef because of the parasite worm, *Onchocerca Gibsoni*, which produces worm nests, usually in the briskets. By order of the Australian authorities all briskets are removed before export even although *Onchocerca Gibsoni* is probably not communicable to man.

There is a similar grading scheme in New Zealand and here again it is carried out by employees of the packing plants and not by Government inspectors. There are eight grades, which are as follows:

Grade One	Prime Ox 160 lb. and less a quarter.
Grade Two	Prime Ox Quarters between 160 and 180 lb.
Grade Three	Prime Ox Quarters between 180 and 200 lb.
Grade Four	Prime Ox Quarters over 201 lb.

Markings

X Mark	Second Ox Quality all weights.
H Mark	Prime Heifer all weights.
C Mark	Cow Beef First Quality all weights.
CX Mark	Cow Beef Second Quality all weights.

South American frozen beef is generally stamped with a code letter giving the grading. Each packing plant has its own private code, so that grade standards are not available for publication.

All frozen beef loses weight while in cold storage due to " shrinkage," but it is difficult to give exact details of the amount of loss. It should not, however, under good storage conditions amount to more than 2 per cent.

Frozen meat which has been badly stored may show in the following manner:

(*a*) The flesh, if in bad condition, will be dark brown or black.

(*b*) If after rubbing the hand against the meat it gives off a tallowy smell.

(*c*) The extent of bruising in handling can only be detected by cutting.

Grading of Meat in the United States

In the United States standards of grading have been set by the Government. The official standards for carcase meat became effective on July 16th, 1939, and are supervised by the U.S. Agricultural Marketing Service. The grades are as follows:

(*a*) U.S. Prime.
(*b*) U.S. Choice.
(*c*) U.S. Good.
(*d*) U.S. Commercial.
(*e*) U.S. Utility.
(*f*) U.S. Cutter.
(*g*) U.S. Canner.

U.S. Prime

Beef from steers and heifers only of an exceptionally high degree of perfection.

U.S. Choice

Beef from steers and heifers only of a relatively high degree of perfection.

Cow beef is largely graded as U.S. Cutter (the lowest grade) but young well-finished beef type cows may grade as high as U.S. Good (third grade).

The joints, which are usually cut from the hind-quarter, are as follows:

Rump, about 30 lb.
Sirloin, about 36 lb.
Thin Flank, about 20 lb.
Thick Flank, about 18 lb.
Topside, about 26 lb.
Silverside, about 14 lb.
Aitchbone, about 12 lb.
Leg of Beef, about 14 lb.

The forequarter is normally divided into:

Fore-rib, about 20 lb. (5 ribs).
Chuck Rib, about 12 lb. (2 ribs).
Leg of Mutton piece, 30 lb.
Brisket, about 22 lb.
Neck Clod and Sticking, about 35 lb.

Boneless beef is imported from South America, New Zealand and Australia. Generally, boneless beef is from animals which are not up to standard export quality. Boning is carried out in the packing plants before freezing.

With boneless beef there must be a certificate attached to each bag stating exactly what it contains.

Each bag must contain only one type of "cut." The standard cuts are as follows:

Shoulder clod.
Spencer roll.
Boneless strip.
Sirloin butt.
Knuckle.

Beef animals which, after stunning, have not immediately been properly bled, give hæmorrhagic beef. Beef of this type is most unpleasant and will rapidly decompose.

Veal

The best quality veal is produced from calves about three months old which have been fed on milk. The flesh should be of a greyish colour. Inferior qualities will be brownish in colour with the fat a dirty brown colour. "Slink" veal, that is meat from the unborn calf or an animal less than six days old, although eaten in France, in this country it is regarded as immature and may not be legally sold for the food of man.

Characteristics

Flesh	Very flabby.
Fat.	Gelatinous.

Horseflesh is easily distinguished from beef. Horseflesh is dark in colour and very coarse in texture, while the fat is yellow and oily. The fat never sets properly while it is softer and a different colour to beef fat. The coarser texture of the flesh must make identification easy, even for the novice. It has a most unpleasant sickly taste with an oily feel to the tongue. Its characteristic somewhat sweet odour is a well-known method

of identification. The bones in the horse are generally larger than those in beef animals. The marrow in the bones is semi-fluid unlike that in beef animals, which sets hard after death.

Under paragraph 38 of the Food and Drugs Act, 1938, there is an obligation to display on any place where horseflesh is sold, a notice to that effect. It would appear that any catering establishment selling horseflesh would be bound by this obligation. Any mixture of food in which horseflesh is included shall be considered for the purposes of this obligation as horseflesh. There is little doubt, as has been notified in the papers of some of the learned societies, that some disreputable café and boarding-house proprietors have used horseflesh. During the war at least one West End hotel was convicted for selling horseflesh. Some types of Italian salami contain asses flesh which, for the purpose of this regulation, is considered as horseflesh. It would appear, therefore, if it could be proved that salami contains asses flesh that a conviction would be proved.

CHAPTER III

THE QUALITY OF MUTTON AND LAMB

SHEEP are known by the following terms while alive:

Ram, Tup or Hogget	Entire male sheep.
Ewe . . .	Female sheep.
Wether . . .	Castrated male sheep.
Theave or Gimmer .	Virgin female sheep.

The animal is a lamb from birth until it is one year old, when it becomes a teg, hogget or shearling.

Lambs and sheep are purchased by the Ministry of Food at a price per lb. of estimated dressed carcase weight.

Lambs are sold on the hoof to the Ministry as First Grade, Second Grade and Ram Lambs. Sheep are sold as First Grade Shearling, First Grade Shorn, First Grade Unshorn, Lightweight Ewes, Heavyweight Ewes, Rams, Unthrifty Lambs and Over-fat Sheep, Unthrifty Sheep.

Sheep, lambs, ram lambs and ewes fit only for manufacturing purposes are paid for at low prices.

There seems to be a definite risk in regard to poor quality animals, which must be slaughtered at owners' risk, going on to the black market. These animals may be illegally slaughtered and sold without any major risk of forfeiture of the carcase. I have been offered carcases of meat, provided there are no questions, in a good many places in England, Scotland and Wales. There appear to be major practical difficulties

of ever knowing, particularly in the case of sheep, the actual number of animals on the hills.

In good quality home-killed mutton the flesh should be dull red in colour with a hard white fat. Fine quality mutton should be " mackerel " backed. The typical red and white bars across the loins should be easily seen. The colour of good quality mutton varies from a light red to a fairly dark brick red. Mutton fat from breeds such as the Cheviot always has a yellowish tinge, and therefore the colour of the fat should be treated with reserve. A yellow appearance in the feet is a different matter, however, as this is a definite sign of advanced age.

Mutton is not damaged by freezing to nearly the same extent as beef, and so it is seldom exported in the chilled state. The characteristics of frozen mutton are a very white fat with crumbly cod fat with the flesh rather dull in colour. The shank bones, as a result of deep frost, are very brittle. It is transported at a temperature of about 15° F., but the importation of chilled mutton is still in the experimental stage.

After the removal of the head and feet the easier method to estimate the age of the carcase is by the appearance of the bones. The break joint, in particular, gives a ready guide. In lamb carcases this joint will show definite ridges with a damp surface. As the animal grows older this joint becomes whiter and the surface roughens. The ribs in young animals will be a pink colour with a tinge of blue. In old animals the bones will be opaque with a bleached appearance.

Sheep in the United Kingdom are troubled with several parasites. Multiceps multiceps is the adult stage of the tapeworm (*T. multiceps*) of the dog. Its

larval stage is found mainly in the brains of sheep, especially young animals. In live animals it produces a condition causing acute giddiness from which the name "gid" is derived. The brain of the affected animal should not be used but the flesh will not be found generally to have been adversely affected.

In severe cases the lungs of sheep sometimes become heavily infected with thin round worms which are thread-like in appearance. It has been stated that 95 per cent. of all sheep in the British Isles, more than two years old, are affected. Normally, food inspectors do not condemn sheep's lungs because of the presence of this parasite. This condition, although perhaps not dangerous to human life, is distinctly distasteful, and I therefore do not consider that home-killed sheep's lungs should be used for human food.

Fluke

The most common parasite found in the liver of both sheep and beef animals is the fluke. It is usually situated in the bile ducts, which are enlarged, while the walls are hard with considerable thickness. The fluke has two openings—one at the head and one at the vent. From the vent eggs are extruded. These are passed with the bile to the first part of the intestines and from thence they are passed out with the excreta. The parasite at this stage is known as the sporocyst, and if it falls on to marshy land will remain alive until it comes into contact with a snail. It penetrates the lungs of the snail where it divides into several small bodies known as radii. The lungs burst and the radii penetrate the snail's liver where they produce secondary radii. The snail then bursts completely and secondary

radii escape on to the marshy ground. The secondary radii develop a tail similar to a tadpole and are able to float in water. Ultimately they climb up a piece of grass and become encysted by the breaking down of the tail which forms a shield. They live in this condition for a considerable time or until they are eaten by sheep or cattle. The parasite passes through the stomach and bile duct and lodges in the duodenum.

The New Zealand Meat Producers Board has its own grading system. The grades are as follows:

Grade One	Prime Wethers and Maiden Ewes under 48 lb.
Grade Two	Prime Wethers between 49 lb. and 56 lb.
Grade Three	Prime Wethers between 57 lb. and 64 lb.
Grade Four	Prime Wethers between 65 lb. and 72 lb.
Grade Five	Prime Wethers between 73 lb. and 80 lb.
Grade Six	Prime Wethers over 80 lb.
Grade X2	Second Quality Wethers 56 lb. and under.
Grade X2	Second Quality Wethers over 57 lb.

The very high standard of New Zealand mutton and lamb has been achieved as a result of good breeding and an extremely high standard of meat inspection in New Zealand.

The only disease which is likely to be found in New Zealand mutton is caseous lymphadenitis. The

organism, the *Preisz-Nocard* bacillus, sets up an inflammation of the surrounding tissues which subsequently causes degeneration and death of the tissue. The centre of the capsule changes as degeneration proceeds from a greenish purulent mass until it has completely dried up like the layers of an onion. The prescapular, the precrural, the superficial inguinal and the supermammary glands should all be inspected when imported mutton and lamb carcases are being handled. The bacillus *Preisz-Nocard* gains entrance through wounds in the feet, through docking the tail, castration, ear marking or clipping. Although rare in this country it has been found to cause serious losses in New Zealand. The glands are important, as the superficial inguinal, precural or prescapular may be full of pus of a greenish colour. A gland may be sticky and glutinous, although fibrous tissue is sometimes set up around. If the animal is healthy the gland dries up and becomes onion-like and caseous but never calcareous.

The import of mutton and lamb without all the lymphatic glands is now permitted under Public Health (Imported Food) Amendment Regulations, 1948, S.I. No. 886 of 1948. This can only be regarded as a most retrograde step which may have serious consequences. It really means that mutton and lamb cannot be examined for caseous lymphadenitis without the full support of a well equipped laboratory.

Australian grading for mutton is rather similar to their system for beef. There are two grades, Good Average Quality (approved for export) and Fair Average Quality (passed for export). Frozen mutton is also imported from Argentina.

Mutton and lamb are much safer meats to eat than beef, if only because the sheep suffer from far fewer diseases than the beef animals.

Goat flesh is dark in colour with little fat. Adult goats, when freshly dressed, give off a typical " goaty " smell. The flesh of the kid resembles lamb and the uninitiated may find it difficult to distinguish from a hill lamb. The tell-tale goat hairs will always be found on the carcase, however, if it is examined carefully, as it appears to be almost impossible to remove all of them.

CHAPTER IV

THE QUALITY OF PORK AND BACON

PIGS, while alive, are known by the following terms:

Boar . .	Entire male pig.
Sow . .	Female parent pig.
Stag or Hog	Castrated male pig.
Gilt or Gelt	Virgin female pig, usually referred to as " clean pork."

A good quality pork should have a pale brown flesh with a fat which is greasy to the touch. There must be no unpleasant smell, and this is a very important point to watch with pork. Fishy pork is caused by too much feeding with fish meal which must be eliminated from the food several weeks before slaughter.

Pork is totally prohibited from being imported from the Continent of Europe, but some frozen pork is admitted from New Zealand and Canada. The importation of pork in the chilled state is still in the experimental stage.

There are several diseases which affect pigs seriously, the main ones being swine fever, erysipelas and tuberculosis. Swine fever is highly infectious and must be notified to the Ministry of Agriculture. It is a condition affecting pigs all over the world but is generally found only in the young animals. The organism has not yet been isolated (*Pasteurella suiseptica*), as it is said to be caused by a " filterable " virus. Swine erysipelas affects pigs over three months old, and is caused by a bacterium but is not notifiable.

The characteristics of the diseases are as follows:

	Swine Fever	Swine Erysipelas
Age	Generally in young animals	Over three months.
Emancipation	Rapid	Gradual.
Joints	Do not swell	May swell.
Skin	Purple areas round back of ears	Colour more scarlet.
Eyes	Almost closed glued	Open and normal.
Kidneys	Hæmorrhages in the cortex	Hæmorrhages throughout the kidneys.
Stomach	Ulcers	No ulcers.
Liver	Normal	Enlargement known as cloudy swelling.

Tuberculosis in the pig is caused by Koch's bacillus which may enter the live animal by:

(*a*) Breathing in a polluted atmosphere.
(*b*) Digestion, particularly feeding on cows' milk containing tubercule bacilli.
(*c*) Broken surface of the skin and by direct contact with tubercule bacillus.

The glands which should be examined in the pig are the submaxillary, the mediastinal and the bronchial in the lungs and the mesenteric lymphatics. If tuberculosis is detected on the pleura the following glands should be examined:

(*a*) Suprasternal.
(*b*) Iliac.
(*c*) Renal.
(*d*) Superficial inguinal.
(*e*) Prescapular.
(*f*) Cervical.

Various kinds of abnormal growths are found from time to time in pork and bacon. There are two main types, malignant and benign, and the malignant type is sub-divided into type as follows:

(*a*) Sarcoma.
(*b*) Carcinoma.

There is no proof that a person would be affected by eating these malignant growths but the whole idea is so repulsive that no catering manager would consider using meat containing them as food. The benign type of abnormal growth is usually cut out by operation on the living animal.

A number of parasites are found in pork, the most important causing trichinosis. Trichinosis is caused by a small nematode worm (*Trichinella spiralis*) found in the intestines of the pig. The female worm produces living larvæ which penetrate the walls of the intestines, so gaining entrance to the blood stream. These larvæ are carried on to the small capillaries where they coil up and eventually die. A cyst in the muscular tissue then forms around them. Infestation of the human subject is brought about by eating infected uncooked pork or pork sausages.

The immature form of the tapeworm, *Tænia solium*, is known as cysticercus cellulosæ and causes considerable damage to pig herds. Pigs may become infested by consuming food contaminated by human excreta containing the active ova of *tænia solium*. Man can be infested both by the adult worm and the ova, and therefore " measly " pork should be burnt and never used for food. It may be found in the heart, tongue, cheeks, neck and flanks in those carcases which have

been affected. It is far more common than the bovine type. The danger of eating uncooked pork or bacon must be regarded as serious. Minor illnesses from this cause, in particular, are probably far more common than is generally realized. Adequate cooking of pork and bacon will, however, completely remove any possible risk.

The characteristics of good quality bacon are a white greasy fat with a pale flesh in young animals. In mature animals the flesh is darker. The flesh of boars is deep red in colour with a tough skin.

The side of bacon in this country is generally cut in the form known as the Wiltshire side. This is a description of the cut only and does not give any indication of origin.

There are two main methods of curing—the dry cure and the tank cure. Bacon produced under the dry cure is injected with brine with a syringe in about twelve places. It is then stacked ten sides high with the flesh uppermost. Each layer of meat is then sprinkled with salt. After a fortnight all surplus salt is brushed off and the sides left to mature.

In the tank cure brine is also pumped, at a pressure of about 80 lb. per square inch, into the flesh in about twelve places. The sides are then placed in a tank of brine for about seven days. During times of scarcity and consequently quick sale this period is often reduced to about four days.

Mild cured bacon should never be stored in temperatures greater than 30° F., but care must be taken that bacon is not stored in too low a temperature, as at 14° F. the fat will certainly be rancid in six weeks and sometimes less.

All imported bacon must be marked with an indication of origin branded and stamped durably on the rind in block letters not less than three-quarters of an inch in height (see the Merchandise Marks (Imported Foods) No. 3 Order, 1934, S. R. O. No. 299 of 1934).

Under the powers of the Public Health (Preservatives in Food) Regulations, S. R. O. No. 775 of 1925, as amended by No. 1557 of 1926 and No. 577 of 1927, it is illegal to use any chemical preservative in the preparation of bacon.

Most of the Canadian bacon coming to this country is imported in bales containing from four to six sides. All Canadian bacon, in addition to the official Government stamp, also bears an export certificate issued by the Government inspector.

In the United States the whole process of curing is under direct Government inspection. The bacon is stamped with an export mark, and is accompanied by an official export certificate. The three-quarter side, known as the Cumberland cut, comprises the side less the ham. This is one of the principal cuts used by exporters in Canada and the United States.

Regulations controlling the standard of Danish bacon exported to England have been in force since 1934. The side is branded " Danish " in a continuous line down the side. Bacon exported to England must also be up to the standard of the LUR grade and must be so marked in red.

The whole system of Danish bacon exports is under rigorous Government control. All bacon must be exported directly from the processing factory, and only from those plants authorized by the Danish

Ministry of Agriculture. These factories are strictly supervised for general hygiene, the maintenance of machinery and veterinary control. All Danish bacon of export quality is cured by the tank method.

CHAPTER V

MEAT INSPECTION AND THE DISEASES OF BEEF

THERE can be no doubt that the majority of catering managers have paid far too little attention to meat inspection, and consequently have apparently chosen to ignore the dangers which may result from the consumption of diseased meat.

Although it is not suggested that every caterer should have a specialized knowledge of all the diseases of all the food animals, he should be able, at least, to recognize the danger signals of the well-known diseases. Provided he can recognize the classic symptoms, it is easy for him to obtain a second opinion to confirm the original suspicion, and, if necessary, to have the meat examined by a bacteriologist.

Before discussing the diseases, it is essential to have an elementary knowledge of the lymphatic glands and the system of which they form an important part. The lymphatic system has been compared with the sewage system of the body. Although it does convey away many of the waste products of the body, it is much more than this, as the yellow fluid known as lymph in its journey through the body carries with it various nutritive foods. The lymph converges into channels and its progress meets various small bodies known as the lymphatic glands. The lymph enters the gland at one side and emerges on the other. Finally, all lymph is collected in the great thoracic duct and is then

propelled into a large vein known as the anterior vena cava and thence returns to the blood.

Lymphatic glands are found singularly or in groups. They vary in size, and, strangely enough, the older the animal, the smaller the gland.

Healthy lymph glands, when cut, should be perfectly smooth and should exude a milky fluid.

The lymph often show signs of ill health in the animal before it is slaughtered. When the lymphatic glands are swollen, have yellow cheesy deposits, gritty deposits, are hæmorrhagic, or have obvious signs of pus, then the meat must be regarded with the gravest suspicion, as these are all real danger signals. These signs are all results of the lymph carrying foreign bodies into the gland where the white corpuscles fight or attempt to fight the disease.

The most important lymphatic glands are as follows:

	Situation
Prepectoral glands	At the entrance of the thorax.
Axillary glands	In a cluster beneath the scapula.
Thoracic glands	Beneath the dorsal vertebræ (these glands are very small).
Lumbar glands	Small glands close to the lumbar vertebræ.
The external iliac	Embedded in the fat in the pelvis.
The internal iliac	Close to the external iliac but nearer to the vertebral column.
Inguinal gland	In the neck of the scrotum.
Ischiatic gland	Between the anus and the ischium.
Prescapular gland	A large gland lying immediately in front of the shoulder joint.
Precrural gland	A large gland immediately above the patella and groin.
Popliteal gland	A large gland which is behind the knee joint.

The glands in the head are as follows:

Submaxillary glands	On the inner side of the jaw-bone near the joint.
Parotid glands .	In the back of the throat.
Pharyngeal glands .	At the back of the pharynx.
Cervical glands .	A chain of small glands in the side of the trachea.
Bronchial glands .	Near the forking of the windpipe.

In addition to these important glands there are also the ductless glands. They are probably more important in the development of the animal than for the diagnosis of disease. They are named as follows:

Pituitary, thymus, pancreas, thyroid, parathyroid, adrenal.

All the blood of the body passes through the kidneys, where all urine and excess matter is extracted from the blood. The kidneys, therefore, are often important for appearance of health or disease in the carcase.

Bacilli enter the body by the air breathed, by the food eaten or by a broken surface, such as a wound. If the bacilli are caught up in the lymphatic stream they are carried by the white corpuscles to the nearest lymphatic gland where the white corpuscles can digest them unless they are too numerous. The poisonous products of bacilli are called toxins, and they destroy the cells around the part of the body where they have gained entry. An abscess will contain whole cells, broken cells, pus and bacteria with a certain amount of fluid. Once the toxins have entered the blood stream they may pass to all parts of the body.

The most serious diseases are tuberculosis which, unfortunately, is very common among home-killed cattle, and anthrax which is rare. I propose to deal

with tuberculosis first and then the other diseases in alphabetical order.

Tuberculosis, caused by Koch's bacillus, is the most dangerous of the diseases which may attack the food animals. It has been suggested that more than 30 per cent. of all cattle in the United Kingdom are affected. The disease is, however, far more common in cows than in bulls or steers. Personally, I never eat cow beef if I can possibly avoid it. Tuberculosis is very rarely found in mutton and that's why I always eat mutton when I can get it! The organs showing the disease are generally found to be affected in the following order:

(*a*) Lungs.
(*b*) Head.
(*c*) Liver.
(*d*) Intestines.

In tuberculosis of the lungs the nodules are usually yellow and caseous. They vary considerably in number and may or may not be gritty. Lesions are often found, in affected cases, in the bronchial and mediastinal glands. In very serious cases large tough tuberculous masses will be found in the lung tissues. The pleura may also show tuberculous nodules.

Tuberculosis in the head is usually only found in the glands. If the tuberculous infection, however, has been found in the liver or the intestines the position may be rightly considered as serious.

The meat inspector is guided by the Memo/62/Foods in regard to the action to be taken when tuberculosis is found in a carcase. Unfortunately, these recommendations are now thirty years out of date, and must be

regarded as completely inadequate. The reported cases of bovine tuberculosis among humans in the United Kingdom is now running at a rate of six thousand annually.

The following details regarding cattle slaughtered during 1949 are available:

	Number killed	Tuberculosis Whole carcases condemned	Carcases of which some part or organ was condemned because of tuberculosis
Birmingham . .	51,685	799	14,852
Cardiff . . .	12,687	237	2,701
Edinburgh . .	21,555	98	3,367
Liverpool . .	51,520	813	5,980
Newcastle . .	28,313	264	3,660
Nottingham . .	19,089	600	5,354

It will be noticed that there are wide differences between the number of carcases found to be infected with tuberculosis, and the number which were totally condemned.

	Totally condemned because of tuberculosis	Partially condemned because of tuberculosis
	Per cent.	Per cent.
Birmingham . .	1·55	28·74
Cardiff . . .	1·87	21·29
Edinburgh . .	·46	15·62
Liverpool . .	1·58	11·61
Newcastle . .	·93	12·93
Nottingham . .	3·14	28·05

This means, of course, that considerable quantities of meat from animals suffering from tuberculosis were released by the Ministry of Food. It is, therefore, nonsense to suggest that because meat is passed by a

meat inspector that it is free from tuberculosis. It is apparent from these figures that considerable quantities of meat from animals suffering from tuberculosis is being passed unprocessed to the consumer—a practice which is quite illegal in many countries abroad.

It has been estimated that two thousand deaths in the United Kingdom occur annually from tuberculosis contracted through infected milk. One authority has stated that in his opinion one in every twenty of our farmers is delivering milk infected with virulent tuberculosis germs. During the war there was a tremendous increase in the number of reported cases which can only be associated with lower standards of meat inspection and milk production.

It was estimated in 1931 that 40 per cent. of all cows in this country suffered from tuberculosis. It has been generally held that to-day the position has most certainly not improved. Eminent authorities have estimated that one in every two hundred cows in this country gives milk infected with active bacilli of tuberculosis. Unfortunately, pasteurization is not always efficiently carried out, as I have seen tubercule cultures developed from pasteurized milk, proving beyond doubt that in those instances pasteurization was incomplete.

In South Wales there has been considerable up-grading of herds to the T.T. herds. Many of the cattle which were found to be suffering from tuberculosis have no doubt been sent for slaughter. It must be considered most unfortunate, however, that animals suffering from tuberculosis, although removed from a T.T. herd, are still permitted to be purchased by other farmers for milk production.

Although I am not now referring to conditions in South Wales, I am alarmed at the number of occasions that meat inspectors have told me that they have been instructed by veterinary inspectors to pass tuberculous meat when they considered that it should be condemned.

Personally, I think that the risk of tuberculous meat in this country is so grave that Public Health authorities should provide instructions to caterers on meat inspection, particularly in regard to the recognition of tuberculosis in the glands.

In Germany, before the war, any meat showing the slightest sign of tuberculosis was processed in the Freibank. The Freibank is a type of retort in which meat is completely sterilized at high temperatures.

The first legislative attempt to control T.B. cattle in Britain was made in 1915 with the passing of the Tuberculosis Order, but unfortunately it was not put into force until 1925. Grade "A" tuberculin tested milk was introduced under the Milk (Special Designations) Order, 1925, but it did little to develop T.T. herds. The attested herds scheme was commenced in 1935 with the additional powers under the Agriculture Act, 1937. G. H. Arthur in the *Veterinary Record*, 1948 (Vol. 60, p. 530), has suggested that a tuberculin ante-mortem test is never entirely satisfactory. In 1949 in Great Britain only one and a half million cattle out of a total of nine million were in T.T. herds. The enormous potential risk must be quite obvious.

The position in regard to slaughter is still most unsatisfactory, as only in the large abattoirs is meat inspection regularly carried out. In the majority of

the rural areas meat inspection still only occurs spasmodically. Too often the sanitary inspector, also holding a meat " ticket," will stick his head round the slaughterhouse door and say to the slaughterman: " Everything all right, Bill? I've a bad case of drains to see about. If you notice anything wrong please telephone me."

In the United States, because of the great clean-up campaign, tuberculosis among cattle is now almost unknown. In a letter published in *The Times* dated November 4th, 1948, by P. A. Moltesen, Agricultural Attaché of the Danish Embassy in London, it was stated:

" I would like to take this opportunity to call your attention to the fact that the eradication of bovine tuberculosis in the Danish dairy herds has made rapid progress during the past few years in Denmark, so that Denmark is virtually free from this disease. In July, 1947, 97·4 per cent. of all Danish herds were ' cleaned-up,' and during the last year this percentage has further increased."

Sigurdsson reported in 1945, *Acta tuberc. scand.*, Supplement, No. 15, the results of his research in Denmark. He is of the opinion that the degree of T.B. in man is directly related to the degree of T.B. in cattle.

John Francis, B.Sc., M.R.C.V.S., in the *Lancet*, January 7th, 1950 (Vol. 258, p. 39), has stated:

" Eradication of bovine tuberculosis will increase the efficiency of meat and milk production. Indeed this may prove to be its most valuable contribution to public health and well-being."

A remark of that type must certainly suggest that meat inspection for tuberculosis is not by any means as

efficient as it might be. Obviously, if all herds are free from tuberculosis, the job of the meat inspector is going to be considerably easier, but in the meantime a rigorous clean-up of the meat inspection methods in regard to T.B. meat is long overdue.

Minced Meat

Ginsberg and Robertson, in a paper published in the *Veterinary Record* of August 27th, 1949, noticed that Standfuhs and Klimmeck have reported that minced meat is the main cause of food poisoning in Germany. The large total of 42 per cent. of all food poisoning was derived from this source. Thirty-two outbreaks were investigated when the following infections were found:

	Per cent.
Salmonella enteritidis (gärtner)	19
Salmonella aertrycke	17·5
Salmonella-like infections	31
B. coli and paracolon organisms	19
Cl. botulinum	9
B. proteus	6

They noticed that the degree of initial contamination differs in nearly every case, and is naturally most pronounced if the handling and preservation of the meat is not hygienic.

The workers of the Royal Commission on Tuberculosis (Cobbett, 1917) gave their firm opinion that bovine tuberculosis was just as dangerous to man as the human type. Griffith, in *Tubercle*, 1937, Vol. 18, p. 529, gave a similar opinion. While Griffith and Munro (*Journal of Hygiene*, 1943, Vol. 43, p. 229) have

shown that the bovine type of tuberculosis was commoner in Great Britain than had formerly been estimated.

The number of new cases of tuberculosis diagnosed in the United Kingdom were as follows:

1945	45,641
1946	45,909
1947	47,186

It has long been known that T.B. infected milk has been the cause of much T.B. It has been held by many authorities that T.B. infected meat is also a virulent source of infection in man. I have, therefore, devoted considerable attention to the basic problems of meat inspection which I hope will be of considerable assistance to all practical caterers.

Actinomycosis

This is a disease mainly located in the tongue. Fibrous tissue can heal the wound, hence the name " wooden tongue." It is also known as " lumpy jaw " and " big head." It is usually confined to the tongue and head, but not infrequently lesions may be found in the lungs, the bones and the stomach. It is communicable to man, and is less rare among human beings than generally supposed. In animals, the submaxillary glands are usually affected. Before the war considerable numbers of bovine tongues from South America were condemned at Smithfield because of this disease.

Anæmia

An animal having insufficient red corpuscles in its body suffers from anæmia, giving the colour in meat a

very pale colour. In life, anæmia may lead to emaciation and "wasting." It should be remembered, however, that emaciation may also be due to flukes in the liver, to an abscess interfering with digestion or respiration or to tuberculosis.

Anthrax

A very serious disease which must be reported under the Diseases of Animals Act. All human beings which have been in contact with the animal or carcase must be kept under observation by the Medical Officer of Health. The spleen is greatly enlarged or ruptured. The blood, looking very much like blackcurrant jelly, is very dark in colour and will not coagulate. The liver and kidneys are darkened and enlarged.

Brine Stain

This is caused by a faulty refrigeration system which has leaked, so staining the meat a greenish colour. It is, however, not serious, unless the muscle tissue has been thoroughly soaked in the leaking liquid.

Black Leg, also known as Black Quarter or Quarter Ill, is a condition chiefly affecting young cattle and is caused by a bacterium called *Clostridium teseri*. The bacterium gains entry through some wound in the young animal. A peculiar condition results as this organism causes gas to swell the tissues. The flesh is dark in colour which, when cut, produces a peculiar smell like rancid butter. With normal bruising there is no rancid smell, while gas does not collect in the tissues.

Dropsy

This is an accumulation of fluid, almost water-logging the tissues in some part of the body; and if the condition is generalized the carcase is unfit for food. In localized conditions a general guide is how the carcase sets within twenty-four hours of slaughter.

Fever

A fevered carcase is unmistakable. A fever in the live animal means that the toxins have been absorbed in the flesh. The flesh is flaccid to the touch and is usually very dark in colour. The carcase will set badly and the blood vessels will usually remain full of blood. The carcase looks most unsightly.

Foot and Mouth Disease

Foot and mouth disease must be notified to the Ministry of Agriculture, who are compelled to take complete charge of the case. Suspicious points are blisters in the mouth or muzzle, and, in live animals, lameness due to infection of the foot on the corona between the hoof and the starting point of the hair. The organism is a filter passer. If foot and mouth disease is confirmed, the Ministry of Agriculture must completely destroy the carcase.

Glanders is a glandular disease, also known as Farcy, and is almost exclusively confined to horses. It is caused by a bacillus (*Pfeifferella mallei*) which can be communicated to man, and is mainly an affection of the lymphatic system in cattle.

Jaundice is associated with abnormal colour. The carcase has a yellow colour with a yellow appearance

of the eye. It may be confused with the yellow appearance of the Jersey carcase by inexperienced people.

In jaundice every tissue is yellow and the liver will be greatly enlarged and very dark in colour. The kidneys, too, will be greatly swollen and abnormal in appearance. The urine will be very yellow in colour and dirty in appearance. The Jersey carcase, on the other hand, will have only the fat showing a yellow colour, as the remainder of the tissues will have a quite normal appearance. It should be remembered that with sheep some ewe strains give a very yellow fat.

Johne's Disease is caused by the entrance of a rod-shaped bacillus. The condition affects sheep, cattle and deer. The bacillus usually gains entrance to the body of the animal through contaminated drinking water. It causes emaciation and extreme diarrhœa in life. The lesions are generally confined to intestines and mesenteric lymphatic glands. If the glands are cut they will appear softer than a gland suffering from tuberculosis.

Nephritis is inflammation of the kidneys. In cases of simple inflammation the kidneys will be enlarged and pale in colour. If pus has formed, then the toxins have circulated through the blood stream and the whole carcase must be condemned.

Pericarditis is the inflammation of the sac containing the heart. The condition is due to infection by micro-organisms. If the animal is killed in the early stages of the disease, it may be necessary to condemn only the heart, but in advanced stages the whole carcase must be condemned.

Rickets is a condition usually found only in young animals. It is due to a lack of lime in the body affect-

ing particularly the bones and teeth. The bones will be easily cut and will be very red in colour. The ends of the long bones will be enlarged, while the marrow will look like blackcurrant jelly.

Tape Worms

There are two main types of parasites found in meat animals. The single-headed type, known as cysticerus, and the multi-headed type are known as multiceps, of which the larval form is called *Cœnurus cerebralis*.

The most dangerous parasite is *Cysticerus bovis*, sometimes found in the muscle tissue (the lean meat) of beef animals. This is the condition in beef known as "measles." It must now be regarded, however, as rare in home-killed beef and far from common in imported quarters. *Cysticerus bovis* is an immature form of the tapeworm of the dog. The tapeworm, in order to gain maturity, has been dropped by a dog, picked up by an animal and then gains entrance to the human body before it will be fully developed.

Cysticerus bovis is generally killed during cooking, as it cannot live in temperatures above 120° F., and therefore it may only be considered dangerous in countries where it is the custom to eat uncooked sausage meat. In Germany and Eastern Europe this has been the custom for centuries, and consequently there have been widespread outbreaks of illness from this cause. There have been, too, a considerable number of outbreaks from this source in the United States among communities of Eastern European origin, where this rather dangerous custom has continued to flourish despite the repeated warnings of the United States Public Health Authorities.

Meat Inspection

The Purpose of Meat Inspection. Meat is examined, under statutory powers, in order to avoid the risk of meat which is diseased or otherwise unwholesome being offered for sale for human consumption.

Unfortunately the examination of food animals immediately prior to slaughter is not an obligation in this country. This would simplify the identification of sick or unthrifty animals, which would permit these animals to be slaughtered separately. The carcase and organs could then be isolated until they had been passed as fit for human consumption by a meat inspector. There can be little doubt that unthrifty animals are a great potential danger in regard to organisms which may cause food poisoning.

It is obvious that meat cannot be properly examined without adequate facilities of good lighting, sufficient space and proper equipment for hanging carcases.

The examination of poultry, except at Smithfield and one or two other markets, have been in the past extremely haphazard. Before the war the examination of poultry at Smithfield became so severe that practically all boiling fowls were being despatched to other markets. Probably three-quarters of boiling fowls coming to Smithfield while the clean-up was in progress were found to be suffering from avian tuberculosis and were condemned.

Meat inspection in England and Wales is authorized under Section 10 of the Food and Drugs Act, 1938. The Act is a consolidating statute of earlier legislation. Under Section 10 an authorized officer of a local authority is empowered to examine any meat or other

food sold or intended for sale for human consumption. The authorized officer must be a medical officer of health for the district, a member of the Royal College of Veterinary Surgeons or a sanitary inspector.

The Public Health (Meat) Regulations, which apply only to England and Wales, control the following matters:

(*a*) The slaughter of animals.
(*b*) The inspection of meat.
(*c*) The marketing of meat.
(*d*) The sale of meat.
(*e*) The storage of meat.
(*f*) The transport of meat.
(*g*) The handling of meat.

The Orders are numbered S.R.O. No. 1432 of 1924, S.R.O. No. 187 of 1935 and S.I. No. 1119 of 1948.

A Parliamentary Committee which sat thirty years ago first officially suggested that butchers' shops should be registered with the local authority. The suggestion, however, has never been put on the Statute Book. It should be remembered that under Section 14 of the Food and Drugs Act it is an obligation for the manufacturer of sausages or potted meat to register his premises with the local authority.

There would appear to be little reason why standards of hygiene in food premises for fresh meat should be lower than in those for sausages. Open shop fronts of butchers' shops have already been prohibited in some countries and there appears to be no valid reason why meat should continue to be treated in so unhygienic a manner in wholesale markets and butchers' shops. The selling of meat from open stalls in the street can only be

regarded as a disgrace in a civilized country, but it is still perfectly legal.

In January, 1940, the Ministry of Food instituted a scheme for the control of the slaughter of livestock and the distribution of meat. As an immediate result of this scheme all meat immediately became the property of the Crown until sold. At the same time the Ministry of Health issued a memorandum to local authorities pointing out that as meat was now Crown property until sold, it could no longer be seized if unsound under the powers of the Food and Drugs Act. There can be no doubt, as a result of this loss of statutory power by local authorities, that a decline in the standard of meat inspection immediately followed. Local authorities were employed by the Ministry of Food as agents for the inspection of meat. It might appear that the meat inspectors simply followed their old procedure, but in practice it appears to be extremely difficult to get meat condemned as unsound as usually it is merely relegated to " manufacturing " quality.

Meat Inspection in Scotland. Meat inspection in Scotland differs considerably from that in England and Wales. Under the powers of the Public Health (Meat Inspection) Regulations (Scotland), 1932 (S.R.O. No. 362/521 of 1932), a local authority must appoint two types of officer—a meat inspector and also a detention officer. The persons who may be appointed are:

(*a*) The Medical Officer of Health for the Authority.
(*b*) A veterinary surgeon.
(*c*) A qualified meat inspector.

The great majority of meat inspectors in Scotland are, however, veterinary surgeons.

A detention officer must have the examination in meat examination of the Royal Sanitary Association of Scotland. A detention officer is trained with the object of enabling him " to recognize any departure from the normal in the carcase, organs or viscera of any animals." If the detention officer finds meat which he considers unsound, then in theory the meat would be held for examination by the meat inspector, but in actual fact usually the meat would be voluntarily surrendered by the owner. Now, however, that the meat is the property of the Crown it may not be formally seized, and in actual practice every effort appears to be made to avoid it being condemned.

CHAPTER VI

THE CHANGES IN MEAT AFTER THE DEATH OF THE ANIMAL

The setting of the meat (rigor mortis) commences soon after the death of the animal. The muscle tissue stiffens in a gradual process from the head down to the tail and is usually complete in about ten to twelve hours. The setting of the meat is caused by coagulation of the myosin in the muscles. The meat from animals slaughtered while in a feverish condition does not set well. Meat from animals which have not been rested will not set any better as a general rule than meat from animals suffering from some virulent type of fever. It is for this reason that animals should be rested at least forty-eight hours before slaughter. Meat will set more readily if it is kept in a warm room after slaughter, while the reverse will be the case if it is put in a refrigerator before it has cooled naturally.

The internal organs should be removed as soon as possible after slaughter, otherwise the meat, in the abdominal region, may be badly discoloured. The stains are most unsightly and have a greenish-yellow colour. They are due to the dispersion of bile from the gall bladder and the commencement of decomposition.

Decomposition (putrefaction) is caused by bacteria which have gained access to the meat after the death of the animal. Decomposition is likely to occur:

FOOD TECHNOLOGICAL RESEARCH

(*a*) When animals have been slaughtered while in a feverish condition.
(*b*) When meat is stored in too hot an atmosphere.
(*c*) When meat is stored in a hot damp atmosphere.

In fresh meat decomposition usually starts near the surface, but in bone taint the putrefaction has set up round the hip or shoulder joint. It is caused by the meat being kept in a hot atmosphere too long after slaughter. Decomposing flesh changes little at first, but later becomes wet to the touch with an offensive smell. Meat in advanced stages of putrefaction is dark green or black in colour. The bacteria causing putrefaction belong to the group known as "Saprophytes." The bacillus generally encountered is *Proteus vulgaris*.

Meat showing serious signs of putrefaction is quite unfit for food. The catering manager would be most unwise to use any part of a hindquarter or forequarter showing distinct signs of bone taint.

Mould formations are caused by the growth of vegetable organisms. Moulds require suitable temperature with adequate moisture and a material to feed on. Moulds apparently do not thrive in the presence of active bacteria. Moulds, however, are generally a sign of faulty refrigeration or faulty storage. For this reason they must be regarded as a danger, although by themselves they are not dangerous. The chief moulds are:

Black Spot (*Cladosporium herbarum*).
White Spot (*Sporotrichum carnis*).
The two fungi, with whiskers (*Mucor mucedo* and *Thamnidium*).

Putrefaction causes vile smells when fully developed, but although unpleasant it is not harmful to health unless associated with secondary infections. Game, such as venison, hares, pheasants and partridges, is commonly eaten in a putrified condition without ill effects by certain classes of English society. Cheeses, such as Stilton and Gorgonzola in Europe, or Limburger in North America, by some people are considered delicacies long after they have gone rotten. In Greenland the Eskimos eat rotten fish or seal meat, while in China rotten eggs have been considered fit for a banquet for many centuries.

Putrefaction of Meat

Meat which has reached a high state of putrefaction, although unpleasant, is not dangerous. The bacilli which cause putrefaction are stronger than the bacteria causing disease and so eliminate them. It is for this reason, in the days before refrigeration that large numbers of people did not die from eating " bad " meat.

The problem of keeping meat in a fit state for human consumption was always present during the eighteenth century, particularly during the summer months. Before refrigeration became available the problem was always acute in the larger houses because of the large stocks of meat. The best methods of slaughter were little understood. Cattle were seldom rested and watered, after long journeys by road, before they were killed, and consequently the meat was often feverish. It is the practice, nowadays, to rest a beast for forty-eight hours, after a long journey on foot, giving it water and a little food. This allows the temperature and circulation of the animal to return to normal,

resulting in a carcase which sets readily and will greatly assist the keeping qualities of the meat. Slaughter was often carried out by persons who were unskilled, while many carcases were doubtless badly dressed. There was no licensing of slaughterhouses, so that cattle were killed by farmers, local butchers or by keepers on the estates of landowners.

Venison was always a difficult proposition; being killed after a hunt, the meat was full of blood and was difficult to keep more than two days.

The following is a typical recipe of the period:

"*To Recover Venison when it Stinks*
Take as much cold water in a tub as will cover the meat, and put in a good store of salt and let it lie there for three or four hours. Then take out your venison and let it lie in as much hot water and salt, and let it lie as long as before, and take it out and dry it very well, and season it with pepper and salt pretty high, and put it in your pantry. Do not use the bones of your venison for gravy, but get fresh beef or other bones."

I think most people using this recipe consider that the seasoning was used, as directed, pretty high. The reason instructions are given for the bones to be discarded is because tainted meat on the bones would turn the stock sour. The marrow inside the bones would be, of course, quite rancid.

"*To Preserve Tainted Venison*
Bury it in the ground in a clean cloth a whole night, and it will take away the corruptions and stink" (1730).

Another condition of meat caused by putrefaction is bone taint. This is the result of too much delay before the meat is put into cold storage after slaughter.

It is essential that all meat is cooled and put into cold store as quickly as possible. There is no external indication but as soon as the meat is cut near the stifle joint there will be every indication.

In cases of decomposition heating in water will greatly increase the smell and so make it easier to detect. If further proof is required, some of the meat should be cooked, preferably by roasting. The resulting smell will then leave no doubt. Stale raw meat is distinctly alkaline to the taste, while fresh meat is decidedly acid.

Phosphorescence

Phosphorescence is due to two bacteria, *Photobacterium sarcophilum* and *Micrococcus plugeri*. This condition is not injurious to health, and indeed immediately the meat begins to putrefy the condition disappears. The meat may be sponged, however, with weak acetic acid and this will eliminate the trouble. The storage chamber in which the affected meat has been stored must be thoroughly cleansed and wiped down with acetic acid. Both bacteria are most active at temperatures below 36° F. I have seen ham, in a refrigerator, with most pronounced phosphorescence, which had only been recently removed from the can.

CHAPTER VII

THE EFFECT OF COOKING ON DISEASED MEAT

The commonest disease in meat is tuberculosis. It is seldom identified in the muscular tissue (the lean meat) but it is comparatively commonly found in the lymphatic glands. Meat from cows more than six years old will often show distinct signs of tuberculosis.

The lymphatic glands may be compared with the grease traps in the drainage system of the animal's body. These filters show distinctly when the carcase is infected with tuberculosis, although from a superficial examination the muscular tissue might appear to be unaffected.

It has long been known that for the efficient pasteurization of milk a temperature of 145° to 150° F. must be maintained for half an hour in order that the majority of the tubercule bacillus may be killed. A liquid is easier to render sterile than a solid mass. Meat, of course, if boiled in small pieces is not difficult to render sterile.

It is, however, when the question of roasting joints of meat arises, as heat penetrates slowly into large pieces of meat, that the position appears to be most unsatisfactory. Joints of roasting meat, in most establishments, are cut into pieces of about 6 lb. weight. Woodhead has found that joints of meat, weighing 6 lb. never reached an internal temperature of more than 140° F. This is quite obviously a dangerous

condition, as it is less than the desirable optimum temperature for milk during pasteurization. It must, therefore, follow that the meat, when roasted, if infected with tubercule bacilli cannot be guaranteed to be sterile when normal cooking methods are used.

It would appear that it may be dangerous to serve or to eat "underdone" roast beef, particularly if it is from aged cows. There has been some tendency to serve underdone meat in order to reduce "shrinkage" during cooking to an absolute minimum. Most canteens are losing money, but any attempt to reduce "shrinkage," particularly from cow beef, would be, to say the least, highly risky.

Woodhead also experimented with meat which had been boned and rolled. He smeared the rolls with tuberculous material and then roasted the meat. He found, after roasting, that the meat was not sterile inside but the exposed meat, after rolling the joint, being subject to direct heat, was found to be quite sterile.

It has been suggested that the tubercule bacillus may set up poisonous toxins which may or may not be rendered sterile in cooking. Little is known about the action of cooking on those toxins. It is, therefore, desirable that considerable care should be shown by catering managers until more results are published of scientific experiments on this subject.

The penetration of heat into a boiled ham was closely studied by Perroncito. He placed a ham weighing about 13 lb. in cold water and brought it to the boil. It was found, when the water boiled, that the internal temperature of the ham was only 77° F., while after boiling for thirty-five minutes the internal tem-

perature had reached only about 100° F. After two hours' boiling the internal temperature was still 100° F., below boiling temperature.

Beveridge and Evans carried out some experiments about forty years ago on the penetration of heat into meat in cans. They noticed that when the can had been placed in boiling water that even after five hours the temperature in the centre of the meat had not reached 212° F.

Certain authorities have suggested that meat may be considered safe if, during the cooking, the internal temperature has reached 162° F.

Cooked meat covered by pastry is particularly liable to be attacked by mould and therefore should never be refrigerated. It is important that no attempt should be made to sell them more than forty-eight hours after manufacture.

Canned meat should always be refrigerated before use, as this will considerably reduce any risk of bacterial action. Canned meat which has been refrigerated will incidentally, slice far more satisfactorily than un-refrigerated canned meat.

The most apparent danger from tuberculosis, however, is from the organs commonly known as offal. The lungs and udder are often diseased with large numbers of tubercule bacilli. As these organs are commonly made into faggots, often in most undesirable premises, this would appear to present grave dangers. When offal is seriously affected it is most unlikely that any cooking will kill all the harmful bacilli. Offal which is badly affected with tuberculosis ought never, in any circumstances, be used for food.

CHAPTER VIII

POISONOUS FOODS, FOOD ALLERGY AND FISH POISONING

THERE are some foods which, although normally safe, are dangerous in special conditions. Potatoes, if exposed above the surface of the ground, will turn green and the alkaloid solanin will be produced. Potatoes commencing to sprout, too, sometimes contain solanin. The solanin is usually close to the skin of the potato and deep peeling will generally remove the risk. It is obviously better not to use green or shrivelled potatoes for human food. During the Irish potato famine of the 'forties of the last century many cases of poisoning, due to alkaloid solanin, were reported as the result of the consumption of green and shrivelled tubers. There appear to be no recent records of similar outbreaks.

Many cases of food poisoning occurred during the 1914–18 war by persons eating cooked rhubarb leaves. The stalk appears to be more potent than the actual leaf. There is no doubt that sufficient oxalic acid is contained to be highly dangerous to human beings and also to pigs if fed to them mixed with other pig swill. Whenever possible rhubarb leaves should be burnt, so that they may not be inadvertently mixed with the swill.

Jordon has described food allergy as follows:

"Allergy is a general term applied to any alteration in the living organism to foreign substances."

It has been noticed that allergic reactions in individuals usually occur in food containing proteins and particularly milk, eggs, fish, cheese, pork and chocolate. Usually a person, if susceptible to food allergy, is affected by more than one food. Sometimes it is produced solely by eating excessive quantities of one food, or in other words it is more likely to occur when there is no attempt to take a balanced diet.

It is probable that neurotic individuals are more prone to food allergy than normal people. We do not yet know how much of the trouble is psychological, but it is probably considerable. It is certainly far more common with clerical staff than with manual workers.

Fish poisoning is uncommon in this country, but eating decomposing fish appears to have very serious effects. Usually, however, the eating of bad fish is not a practice indulged in by responsible individuals.

Decomposing fish can be easily recognized by the following features:

(*a*) By inserting the finger along the backbone of the gutted fish and smelling.
(*b*) Sunken eyes of a greyish colour.
(*c*) Gills becoming a grey colour later, as decomposition advances, turning slimy and green.
(*d*) The abdominal wall having a pulpy soft appearance.
(*e*) Pink appearance of bone from tail to head is a sign of decomposition.

If the vent of a flat fish is turning green, the fish is suspect and a careful examination should be made of the sound and backbone.

Fish which have not been properly gutted (foul gutted) decompose rapidly when removed from ice.

The points of a fresh fish in good condition are:

(*a*) Brightness of the eye, with jet black convex pupil and transparent cornea.

(*b*) The gills bright red in colour and free from slime.

(*c*) Firm flesh. Particular attention should be paid to the area under the sound. If a finger is inserted at this point and smelt, any staleness will be immediately apparent.

It has been stated by some authorities that discoloration of the belly flaps means that the fish has gone stale or has begun to putrefy. Colour in such fish as the sea bream, where it is a bright sheen rather than a definite colour, may be accepted as a guide. At the same time colour as a guide to freshness in fish should be used with caution.

The belly flaps of cod and haddock from the Barents Sea or the Bear Island fishery are often dark red when the fish is caught. This colour may have become still darker by the time the fish is landed. This characteristic should be regarded with reserve as often Bear Island fish with dark red belly flaps are still in prime condition.

The colour of the upper skin in flat fish often varies enormously between fish caught in one area and those from another. Fish from the Faroe Bank, a fishing ground south of the Faroe Islands, are very light in colour, while those from Icelandic waters are usually very dark. These characteristics are also noticeable in round fish such as cod and haddock from these fishing grounds, but they are not quite so obvious as with the flat fish. It has been suggested that coloration in both salt water and fresh water fish is largely determined by the food supply.

We do know, however, that fish having full stomachs when caught will not keep so well as fish caught between their feeding periods.

Few sea fish are landed showing signs of disease. On extremely rare occasions a fish may be seen with a tumour. Normally it would be condemned before being sold in the quayside market. Although only a very small proportion of the catch is affected in this way, when a specimen does turn up it is usually a halibut or a catfish.

At Grimsby, in an average year, the fish inspectors condemn about five thousand tons of fish. Undoubtedly every effort is being made to divert from the food supply any unsound fish at the port of entry. In the United Kingdom something like ten thousand tons of fish are considered unfit, by the inspectors, for the food of man every year.

A fresh fish will be stiff and quite rigid with a sheer and bright external appearance.

It would appear that many persons, probably far more than is generally realized, are allergic to fish which are "unclean," that is during the spawning season. The roe in particular of many species of fish during the spawning season seems to bring considerable discomfort to many people.

Fish are out of season during the following times:

Brill	April–June
Catfish	November–January
Coalfish	January–May
Cod	February–April
Dab	February–June
Dory	June–August

Flounder	February–June
Haddock	February–April
Hake	March–June
Halibut	April–May
Lemon Sole	April–August
Ling	March–July
Mackerel	May–June
Megrim	March–May
Plaice	January–May
Pollack	February–April
Skate	November–January
Sole	March–June
Turbot	April–August
Tusk	April–June
Whiting	February–June
Witch	May–August

Fish should never be stored in a refrigerator containing other foodstuffs, as it is certain to contaminate them with a fishy flavour. Frozen fish travels long distances from the fishing ports far better than fresh fish. Once defrosted, however, it deteriorates more quickly. Defrosting should not be hurried and usually at least eight hours will be required for this process. Once defrosted, it should be used within the following twelve hours.

It is to be regretted that in recent years the quality of smoked haddock has greatly deteriorated. Dyes have largely taken the place of the old smoking processes, resulting in a product with poor flavour and inferior keeping qualities. Consequently in some places there has been complete revulsion against smoked haddock and kippers. It would appear that

only in the West of Scotland are the old methods still used, providing a greatly superior article to the other processing centres. The test for annatto is quite simple. A drop of sulphuric acid is placed on the fillet. A blue colour will normally appear, but if no reaction occurs that is evidence of an aniline dye instead of proper curing.

Parasites in fish are very rare, the best known being filaria bicolar. Specimens of cod are occasionally badly infected with this white threadlike worm in the muscular tissue. No one, however, is likely to use a fish in that condition as food, even although it is not harmful to human beings, as it is killed during the process of cooking. Fish from the Faxi Bank, a fishing ground off the West coast of Iceland, seem to be particularly prone to infestation of these threadlike worms. Filaria bicolar is not, however, in any case harmful to human beings.

Because of the rarity of these worms apparently little research has been carried out on them or on the very rare flat worms sometimes also found in the cod. It would be interesting to know why the cod is more easily attacked by these parasites than other fish as tapeworms, too, occur more often in these than in other fish.

In a statement issued during October, 1948, by the Ministry of Agriculture and Fisheries, it was stated that the quick freezing of fish would be encouraged.

It was suggested that white fish, for storage up to eight months, must be refrigerated at a temperature of —20° F. (52° of frost) and fatty fish, for a storage period of six months, must be refrigerated at a similar temperature.

Undoubtedly quick freezing will do a great deal for the fishing industry in sorting out its present difficulties of gluts and shortages.

It is certainly time that legislation was introduced to deal with the problem of dirty fish boxes in a similar manner to the statutory obligations upon users to clean milk churns. New boxes now being issued by fish merchants at the principal fishing ports have an internal lining of plastic. This plastic lining, so long as it remains undamaged, will prevent fish-spoiling bacteria entering the wood. It is regretted, however, that far too many users return fish boxes to the ports in a filthy condition, which may adversely affect the next customer, particularly in hot weather. The ideal answer would, of course, be a non-returnable container. Unfortunately the experimental ones which were put into use have not proved too satisfactory.

There have been a considerable number of cases of poisoning caused by shell fish. The most important commercially are oysters, escallops, cockles and whelks.

Oysters are not considered fully grown until they are four to six years old. Disease is rare in oysters, but they are vulnerable to contamination by polluted sea water. Oysters which have been in polluted sea water may be cleaned by being transferred to clean sea water from ten to fourteen days. There is an important cleansing station at Conway operated by the Ministry of Agriculture and Fisheries. Fresh oysters have tightly closed shells. If the shells are gaping, the oysters must be regarded as quite unfit for food.

It is a common fallacy that eating oysters when there is no " R " in the month is dangerous. This is conservation fallacy, as oysters during the summer months are

definitely not dangerous, although they are not so fat as during the winter months.

Mussels are in season from September to April, but they are most sensitive to pollution, though they may be cleansed in a similar manner to oysters. Stale or dead mussels will have gaping shells when they must not be used for food. They are usually sold in canvas bags. When the bag is shaken the mussels will rattle in a distinctive manner owing to the shells being open or separated.

Escallops. The flesh resembles a poached egg, as the round white mass has an orange " foot " partly encircling it. The shells are always slightly open. If the " beard " is lightly touched, the escallop, when alive, will be seen to move. If the escallop smells stale or there is no movement when the beard is touched, on no account should the shell fish be used as food. Escallops are found only in deep water and therefore they are less liable to contamination by sewage than other shell fish.

Cockles and whelks are found in the sandy estuaries of rivers and so are very liable to contamination by pollution. Owing to the enormous pollution round the coasts of the British Isles, cockles must always be regarded with grave suspicion. Cockles from polluted fishing grounds have been proved to be the cause of enteric fever on a large number of occasions.

Owing to the internal conformation of cockles it is not possible to cleanse by placing them in clean sea water. Cockles must be regarded as suspect, particularly as they are generally cooked in iron pots on the seashore by local gatherers. The cockles pass through many hands before reaching the consumer.

Catering establishments would be well advised not to handle them.

Every year during August, September and October, many incidents of suspected poisoning occur from cockles gathered in the polluted waters of the Southern English and Welsh Coasts. It is fair to say that any sample of cockles purchased from a stall will almost certainly be found to be grossly contaminated with bacteria if examined by a bacteriologist.

Under Section 39 of the Food and Drugs Act, 1938, a local authority may set up a cleansing station for shell fish.

Crabs. The shell is cast from time to time as the animal grows. When without a shell or after casting, when the new shell is forming, they are known as " soft shelled crabs." These may not be sold under the powers of the Fisheries (Oysters, Crabs and Lobsters) Act, 1877. Crabs less than four and a quarter inches across the broadest part of the back, under the same Act, must not be sold. Crabs are best in the months of April, May, June and July.

Boiled crabs tend to deteriorate rapidly in hot weather. An unmistakable odour and severe discoloration of the apron accompanies this change in condition.

In order to prepare the crab for the table the middle part of the crab should be wrenched up and taken away cleanly from the main shell. The yellow part is the liver and is quite fit to eat. The lungs are pale brown claw-shaped pieces. These parts of the crab are sometimes known as " dead man's flesh." Although these are unpleasant to eat, they are not dangerous, except perhaps to the infirm.

Lobsters are in their best condition during the summer months. It is illegal to sell a lobster while it is in the soft shell condition, under the Fisheries (Oysters, Crabs and Lobsters) Act, 1877. While under the same Act it is also illegal to sell any lobster which is less than eight inches in length, when spread flat, from the tip of the beak to the end of the tail.

The tail should retain its elasticity, even after boiling, if the fish is fresh.

Fungi. A great many people imagine that they can differentiate poisonous fungi from edible ones. They base their opinions generally on the following factors:

(*a*) That the skin may be peeled.
(*b*) That during cooking it will not turn a silver spoon black.

Unfortunately, however, these tests are by no means infallible as the very poisonous fungus *Amanita phalloides* (the Death Cap) will pass the test for an edible mushroom on the factors already given. The only real test for a fungus is that it should be of a species known to be edible.

You will no doubt read in a great many books the methods for the identification of many species of fungus. Like a great many other matters, however, theoretical knowledge of edible fungi is useless without a great deal of practical experience.

Poisonous fungi may be divided into two types. Those which are deadly poisonous and those which are emetics. In addition, however, there are some such as *Agaricus xanthodermus* which are poisonous to some people but not to everybody.

The principal edible fungi from the fields are:

(*a*) Young puff balls.
(*b*) *Sparassis crispa.*
(*c*) *Lactarius deliciosus.*
(*d*) *Lepiota procera.*
(*e*) *Boletus edulis.*
(*f*) *Tricholoma personatum.*

I am not going to attempt to describe the edible species of fungi, because I consider that this information should not be used by people who are unwilling to give specialized study to the subject.

The genus Amanita is notably dangerous, only one of which is edible: *Amanita rubescens.* Anyone who endeavours to sort that one out without adequate botanical knowledge is just asking for trouble.

The Crested Agaric is highly poisonous and may be easily confused with the edible *Lepiota procera* and *Lepiota rhacodes.* The poisonous Purple Agaric (*Cortinarius purpurascens*) is somewhat similar in appearance to the edible *Tricholoma Nudum* and *Tricholoma personatum*, while the poisonous Yellow Staining Mushroom (*Psalliota xanthoderma*) is similar in some respects to the edible Horse Mushroom. It is obvious that experiments cannot be recommended to amateurs. The identification of fungi is a matter for experts particularly, as it should be remembered that an error may be the difference between life and death.

The general caterer would be well advised to use only cultivated mushrooms marketed under a recognized trade mark by a reputable firm.

CHAPTER IX

REFRIGERATION AND STORAGE

It is important, after food has been purchased in good condition, that every precaution is taken in catering establishments to ensure that it does not lose condition during storage, processing or selling.

All perishable foodstuffs must be kept in a refrigerator. The temperature should not be above 40° F., although fruits and shell eggs should never be stored below 45° F. The only exception is in regard to low temperature freezing of fruits, which is something quite different from refrigeration for short periods.

Most refrigerators in catering establishments are the mechanical direct expansion type in which a compression unit furnishes the refrigeration. The refrigerating medium is a chemical compound which is a gas at room temperatures but a liquid when compressed. Freon is now the most popular refrigerating agent, as it is not poisonous to food or man if by mischance it should be released through defective coils.

The compressor unit compresses the gas into a liquid. This liquid is then forced through small copper tubes to the freezing unit. In the freezing unit a valve releases the pressure and the liquid passes into larger diameter tubes where it changes into a gas. As the freon changes from liquid to gas it absorbs heat from the inside of the refrigerator. The gas (freon) then returns to the compressor where it is again turned into the liquid state. The temperature is controlled by the thermostat controlling the compressor unit.

In large catering establishments refrigerators are generally cooled by pipes containing cold brine which is cooled and circulated by a central refrigerating unit which is often housed in a separate motor room.

Everything should be done to encourage the circulation of air inside the box. Such practices as stacking food on the top of the cooling units or immediately in front of them can only be regarded as crazy. Food should be stored in refrigerators in minimum size containers, so allowing the cold air to reach the innermost layers as quickly as possible. For a similar reason sliced meat should never be stored in heaps exceeding 5 in. in height. In refrigerators of less than 1,000 cu. ft. capacity it is better that internal drains should not be fitted.

Hot food should never be put into a refrigerator, but how often one sees it done. Hot food will cause the temperature and humidity to rise and in bad cases it will cause mould growth and putrefaction.

Refrigeration, with some people, appears to be an end to all ills, but this, of course, is not so. Foods which are refrigerated need quite as much attention as unrefrigerated foods. It should be generally understood that once frozen foods have been frozen they must not be defrosted until it is time for them to be prepared for actual cooking. Many catering establishments have too little refrigerating space, so that when the refrigerator is defrosted everything inside is defrosted too. Nothing could be more dangerous. Any bacteria which having changed into spores during the freezing process will become active again as soon as the temperature rises above 34° F. As the temperature rises during defrosting the bacteria will multiply at an

enormous rate. After defrosting has been completed and the refrigerator "switched on" again, all these bacteria will not be destroyed but some will hibernate as spores. Immediately the food is defrosted a second time these bacteria will once again become active, when they will again be most highly dangerous.

It should be a standing rule that when it is intended to defrost a refrigerator all food must first be removed to a second refrigerator. When this is not available, however, it merely means that selling prices are being kept down at the risk of grave danger to health of anyone eating food in that particular catering establishment.

Refrigeration is a defence for food against high temperatures and partly for high humidity. It does not prevent contamination of food by other strong smelling foods. Cheese and apples, if refrigerated with other food stuffs, will contaminate them with flavour and smell. Adequate low temperature refrigeration should be provided for fresh meat. A general purpose box opened frequently with resulting violent temperature fluctuations is not suitable for the purpose. In any case, food in a refrigerator must be inspected daily.

Mould growths are caused by fungi, which form threads (whiskers) which spread across various types of foodstuffs. All fungi must have suitable temperatures and adequate humidity to develop readily. They grow best in conditions in which bacteria cannot live, and indeed moulds cannot live long in competition with bacteria. Moulds generally develop because of fluctuations of temperature in a refrigerator.

Moulds certainly look most uninviting but they are

not dangerous and are not injurious to health. Infected storage chambers must be thoroughly cleaned and disinfected to prevent any spreading of the mould.

"Black spot" mould (*Cladosporium herbarum*) can develop in temperatures between 18° and 60° F. The black spots range in colour from olive green to black and are seldom more than half an inch in diameter. Black spot is seldom seen except on chilled beef which has been removed to storage considerably above 20° F. It must be treated by the removal of the affected parts.

White spot (*Sporotrichum carnis*) is seldom found on meat carcases below 32° F., but is occasionally found on frozen rabbits.

"Whiskers" may be caused by either *Mucor mucedo* or *Thamnidium*. Infected meat may have extensive growths above 32° F., but below this temperature they are very seldom seen. Both moulds have an appearance very like the whiskery appearance of hoar frost. They may be removed by sponging with weak acetic acid.

Green mould is caused by the well-known fungus penicillium, but it is seldom found on meat. It is, of course, found on certain types of cheese but it is not harmful.

Condensation is accelerated by glass containers and metal cans causing water to drip off at temperatures above freezing. All glass and metal containers should, therefore, be stored in the lower part of the refrigerator. Food which is going "off," or smells unsatisfactorily, should never be refrigerated. It is to be regretted that refrigerators are often greatly abused by overloading.

Butter, margarine and cooking fat must be refrigerated; unless this precaution is carried out there is a

grave danger that the fats will become rancid. The fats may be stored in the original cardboard containers if these are clean. If, however, the containers are dirty, in order to avoid any possibility of mould growth the fats should be placed on clean, preferably stainless steel, trays.

Dried egg is one of the most perishable of all foodstuffs. Care should be exercised that it is stored in a dry place. Dried egg, after reconstitution, must be used quickly and always on the day that it has been made up.

Cold sweets containing jelly or custard should never be served more than twenty-four hours after manufacture, while synthetic cream must always be added on the day of service.

Milk should always be refrigerated when not actually required for service. In large catering establishments with a heavy gallonage of tea, a separate refrigerator in the tea point should be provided. Expenses of this type, however, are often forgotten when the price of tea is under consideration. Milk for diet cases should be purchased in non-returnable waxed cartons. There is a statutory obligation on the catering establishment to wash all milk churns thoroughly before returning to the supplier.

Cakes and pastries are best stored before sale in cake trays in tiers in a portable cake trolley. Each trolley should be washed down daily with Teepol to prevent any possibility of mould growth. Synthetic cream must be treated with care and must be made up daily. Cakes containing synthetic cream should not be sold more than twenty-four hours after manufacture.

It is most important that food stores should be kept

clean at all times, while all food containers should be kept scrupulously clean. Attention should be paid to equipment in the food stores. Too often any old broken-down table is provided for cutting up bread and butter and other foodstuffs, which is obviously false economy. There is no point in providing good food and good handling facilities if all the good work is destroyed by bad storage conditions. Food store-rooms should be made fly-proof and rat-proof.

Food should not be stored against outside walls and preferably not against any wall. Considerable damage by mould may result, while canned foods may become rusty if this precaution is not carried out.

Food should be stored off the floor either on duck boards or on shelves. Storage on the floor will restrict the full circulation of air, which may cause the food to become damp. Piling food on the floor, too, will make cleaning difficult which in turn may produce insect breeding grounds.

In emergencies, dry ice (solid carbon dioxide) may be used in small refrigerating cabinets. The temperature of solid dry ice is about—110° F., so that when brought into atmospheric temperatures it evaporates very rapidly into a non-inflammable and odourless gas. Dry ice expands to about seven hundred times its own original volume and so is an ideal refrigerant for mobile containers. It must be treated with care and unless heavy gloves are used while handling it severe frost-bite will ensue.

The commonly encountered pests in a food store are those associated with dried fruits. The two moths, *Ephestia cautella* and *Ephestia clutella*, are particularly noticeable in consignments of dried fruit from the

Middle East. If these pests are not controlled they may spread to other foodstuffs. The pests appear to be imported within dried fruit in the larval stage and hatch out usually when they reach temperatures above 60° F. If possible, the fruit should be washed and thoroughly dried by being rubbed between clean cloths. This, however, may be difficult if a large quantity is being considered. If immediate washing is not possible, refrigeration at about 40° F. or below will prevent the larvæ hatching out into moths.

Artificial heating in food stores is most undesirable as, if the temperature is kept low, there is little risk of damage by insect pests. Cockroaches and most other insects, which feed on foodstuffs, will not breed at temperatures much below 65° F.

Probably the most common of all pests in food stores is the Mediterranean flour moth, *Ephestia kuchmilla*. The larva of this moth, as it moves about in the flour or other foodstuff, leaves behind a silken tube which mats with food particles into a sticky mess. This infested food is certainly unfit for human consumption.

CHAPTER X

STAFF HYGIENE

The foundation of all hygienic food practice depends on the care to personal cleanliness of food handlers. Clean habits of all food handlers are essential to produce clean food. Clean hands is the point on which all personal hygiene for food handling must pivot. This is not to suggest that bodily cleanliness and good health also are unnecessary. They most certainly are and a good standard is essential. Pilferage has risen enormously compared with the position before the war. The improvement in welfare facilities has given greater opportunities for people with corrupt morals to carry out petty thefts.

In factories it is now obligatory upon the employer to provide adequate washing facilities. In many cases Companies have also provided hand towels and nail brushes, but losses from pilferage have been so enormous that many of these issues have been discontinued. Roller towels, if provided, should be adequate in number and changed daily.

Communal towels in catering establishments are generally a menace. Too often, particularly in small establishments, a greasy oily rag is seen hanging up in the kitchen on which periodically the cook or cooks wipe their hands. Under these conditions it is often surrounded by a swarm of flies, while the stench must be smelt to be believed.

The "pull-down" type of machine, giving a section to each individual is an improvement over the roller

towel. In theory paper towels are excellent, but in practice they are subject to much abuse. After being thrown about the floor, some individuals appear to like blocking the drains with them.

The Protective Clothing Regulations have placed a severe obligation upon factories to provide protective clothing for certain tasks in various industries. Unfortunately, pilferage of protective clothing from some factories has been colossal.

It is such an obvious fact that adequate washing facilities should be provided that it is amazing the number of catering establishments which have the most inadequate arrangements in regard to hand basins, soap, hot water and towels.

The staff handling food must be clean and healthy. The condition of the hands is particularly important. Nails must be kept clean and short, while nail varnish should be discouraged. It should be remembered that surgeons, in order to destroy germs on the hands, merely wash them with hot water, soap and a brush. This method will destroy all germs provided it is carried out efficiently. Any small cuts on the hands of food handlers should be covered by a waterproof type of plastic bandage.

Muslin turbans should be provided as hair coverings. These are efficient and easily laundered, but "halos" are quite useless. Unfortunately, many girls dislike wearing turbans, not only in factories, but also in catering establishments. The number of scalping accidents every year in factories is by no means inconsiderable.

The general complaints against turbans are that they are hot to wear and sometimes ugly. The question

of colour and design can usually be overcome by allowing the girls to choose their own design and colouring. The general objection to the wearing of any type of head covering is more difficult to overcome. It is noticeable that chain stores enforcing the rule in their food departments generally pay a considerably higher rate than local cafés with little sense of hygiene.

The Manufactured Meat Products Working Party (1950) has stated under paragraph 180 of their Report that:

> " The wearing of head coverings by other workers is not considered of sufficient importance to warrant inclusion in regulations."

Food handlers should not sneeze over food, but it is just as important that food, whilst awaiting sale, should be protected, by use of show cases, from contamination by customers coughing over cakes, sandwiches or other cold food.

Wet floors and bad smells are bad for the morale of workers, while pleasant working conditions greatly assist in the improvement of hygiene both directly and indirectly.

I believe that notices and posters generally give little assistance to the carrying out of policy decisions. Too often posters are unsuitable and are displayed for too long a period. As a consequence people do not bother to look at the notice board because they only contain " notices of last month's football team." Generally, I believe that the appeal of the poster has been greatly overrated in many quarters. It is the same old story that heavy selling too often defeats its own objects.

The bed-bug, *Cimex lectularius*, is one of the great

social problems of modern times. It is found generally in overcrowded and badly housed areas of the industrial towns. In fact, just those areas from which many catering establishments draw their employees. Some authorities have estimated that 90 per cent. of the houses in industrial areas are infested. From my own observations I believe that this is an over-estimate, but nevertheless the figure is no doubt quite a high one.

The bed-bug, flat and oval in shape, measures about a quarter of an inch long. Bed-bugs have a most evil smell and in badly infested rooms the stench is unbearable. It has not yet been conclusively proved that bed-bugs carry disease-producing bacteria. The danger, however, is that a dirty person carrying them can transfer them to people, however clean, with whom they come in contact. Probably the greatest risk of " picking them up " is from cinema or bus seats.

There are three types of lice which may be carried by human beings.

The head louse (*Pediculus humanus capitis*).

The louse of the body (*Pediculus humanus corporis*).

The crab louse (*Phthirius pubis*).

The head louse lives mainly on the hair. The eggs, when laid, are stuck to the hair by the female. The head louse is grey in colour. Unfortunately, it is a common insect and therefore anyone coming in contact with them can have the unfortunate experience of collecting some. Regular shampooing of the hair, however, appears to be sufficient to kill them. The body louse is rather similar in appearance to the head louse, but it is usually found on the body.

In Birmingham the following numbers of people have been treated for head and body vermin:

	Men	Women
1946	577	162
1947	567	115
1948	539	205
1949	361	209

No cases of head lice as distinct from body lice have been found in men since 1946 and then only one case. In women, however, there has been considerable variation as follows:

1946	120
1947	97
1948	155
1949	188

The crab louse, more generally known as "crabs," can be distributed, under crowded conditions, by a single infected person to a large number of people. In this respect the common use of a single towel must be regarded as most unsatisfactory.

The flea is a serious menace to health, as it is capable of carrying many types of harmful bacteria. The human flea, *Pulex irritans*, is quite common and may be found on the body or in the hair of persons with dirty habits.

Scabies

There has been undoubtedly a noticeable decline in the number of cases. In Birmingham, for instance, the number of people treated by benzyl benzoate cleansing centres in recent years has been as follows:

	Men	Women
1946	4,219	5,496
1947	2,233	2,677
1948	1,067	1,203
1949	464	556

CHAPTER XI

BUILDINGS AND EQUIPMENT

A WELL-BUILT and equipped catering establishment should cost very little to maintain. In badly planned establishments or in cases where the equipment has been badly installed, a packet of trouble and expense is only to be expected. Additional expenditure on the building is mainly due either to constructional faults or faulty planning, particularly in regard to insufficient space in one place or another. Faulty construction can be obviated by employing a good architect, but faulty planning may be due to inefficient or incomplete information from the catering manager or other official responsible for producing probable user figures.

In establishments where it has not been considered advisable for the walls in the kitchens and cloakrooms to be tiled, the cost of re-painting in a heavily industrialized area may be very heavy. During the planning stage the question of wall tiling requires serious attention.

Walls

The Manufactured Meat Products Working Party (1950) has recently recommended that, in premises used for manufactured meat products, "The walls of newly constructed or newly converted rooms should be tiled to a minimum of 5 ft." The same Working Party has recommended that 8 ft. shall be the minimum height of a workroom (Section 96).

Ceilings

False ceilings must be regarded as an absolute menace. In a short time they become a breeding ground for insects and rodents.

Floors

Floors should slope to an adequate drainage channel. A pitch of $\frac{3}{16}$ in. to the foot is not unreasonable in a large kitchen. Drain openings should not be too small; a good size is 12 in. by 12 in. with 5-in. piping.

Flooring tiles, made from clay, are of two types—quarry tiles and tessellated tiles. Quarry tiles are manufactured from unrefined clay and are available in blue, red, brown and buff. They are very attractive and hard wearing in their rather "pastel" shades. The best kind of quarries are known as adamantine. These are more accurately made than the ordinary quarry and having finer joints may be used in heavier conditions than the normal quarry. In kitchens of large establishments the adamantine quarry tile is to be strongly recommended. In small establishments the normal quarry will be quite satisfactory. Quarry tiles for kitchens must not be less than $\frac{7}{8}$ in. thick and must be accurately made in order to have as small joints as possible. Cheap tiles will be most expensive to maintain as they will be continually "coming up" because of bad joints.

Vitreous tiles are not to be recommended for use on floors in catering establishments, although they can be used to advantage on wall areas.

Terrazzo is made from small granular marble chips mixed with coloured cement. Generally the mixture is two parts of marble chips to one part of cement. The

cement bed should be at least 1 in. thick but the laying of terrazzo should be carried out only by a company specializing in the work. It is easy to keep clean, and cheap to maintain, if properly laid.

Although concrete is a hard wearing floor material, it is essential to prevent dust formation that the surface should be treated with a brand of surface hardener containing sodium silicate. The surface appearance can be improved by treatment with a mixture of coloured cement and hard wearing aggregate, such as span. Concrete floor paints are manufactured for facing the surface, but generally they must be regarded as unsatisfactory, particularly under the wear of heavy traffic. Concrete floors never look really clean and are not to be recommended. In Army kitchens of static camps where concrete floors are universal, it is in my experience the practice to keep the floor covered with water in a vain attempt to keep it clean.

Granolithic may be laid as a topping on set concrete or it may be laid on the top of concrete still wet. Granolithic is made from Portland cement, granite chippings, hard aggregate and water. A granolithic "carpet" when laid on concrete should be at least 2 in. thick. Granolithic flooring wears badly if in contact with acids and grease. It can never be said to look very attractive and is difficult to keep clean.

In small establishments linoleum may be satisfactory if laid in the heavier grades. It is essential that the floor should be level and even, otherwise excessive wear will result. Linoleum cannot be laid satisfactorily on concrete, and any attempt to do so will only result in the ruin of the linoleum in a very short time. In large establishments it cannot be recommended,

and it is very expensive in replacement cost if used in commercial kitchens.

Rubber in sheet or tile form deadens sound and looks attractive in bright colours. In high-class establishments it is very satisfactory. It cannot be considered suitable in canteens, especially if men come in to meals in working boots, as oil and grease will quickly rot it.

Rubber flooring is laid by means of an adhesive consisting of rubber in solution with petrol. It must, however, be laid by highly skilled men, otherwise it is likely to rise in unsightly "blisters." It cannot be used effectively in kitchens as grease will quickly destroy it.

Parquet is very attractive but it is expensive to lay and to maintain, particularly where there is heavy traffic. Ordinary floors of timber board are most unsatisfactory, as they cannot be kept clean except by continual scrubbing. Timber flooring makes an ideal breeding ground for cockroaches and other insects, particularly if the boards do not fit well.

Temperature

In the United States it is the practice to have a winter temperature of about 66° F. and about 70° F. in summer. Air movement is generally maintained at 20 ft. per minute, with a humidity of between 30 and 70 per cent.

Lighting

Lighting should be sufficient for all visual tasks. It should be properly distributed and diffused without glare. Twenty foot candle power is usually sufficient

for normal working, but a higher power will be required for inspection work. Light intensity is measured by means of a light meter.

It appears strange that no standards of lighting have been fixed by the Food and Drugs Act, 1938. In the United States all rooms in which food is prepared or served must be adequately lighted. For practical purposes it is considered satisfactory if artificial light is provided to give illumination of ten foot candles on all working surfaces.

Storage rooms, however, are considered satisfactory if the lighting is of the intensity of four foot candles at a height of 30 in. from the floor.

Fluorescent Lighting

Until comparatively recently fluorescent lighting presented special difficulties as a means of illuminating food. Certain kinds of cooked food appeared, under the lamps, to be a most unpleasant colour. The larger ranges of lamp colours, now in production, have overcome these difficulties by different mixings of the fluorescent colours.

The colour lamps which are now available are as follows:

Natural, mellow, daylight, warm white and colour-matching. Mellow is the colour which is most popular in kitchens and the other places where food is prepared or served. " Mellow " does not take away the natural colouring of food, and therefore it is only natural that its popularity is rapidly increasing.

By fitting the reflectors of fluorescent lamps in a continuous line the cost of installation may be greatly reduced. Fluorescent lamps are generally produced in

the following ranges: 2 ft. (15 watt), 2 ft. (20 watt), 2 ft. (40 watt), 3 ft. (30 watt), 4 ft. (40 watt), 5 ft. (80 watt).

Great improvements have been made in the design of the partially enclosing reflectors. The control gear, consisting of choke starting switch, condenser and capacitor, is concealed in a casing at one end of the reflector in the majority of the new models. The life of a fluorescent lamp is now about 3,000 hours as a result of intensive development. It would appear that the lamp manufacturers now consider that the future lies with fluorescent rather than filament lighting. It is generally considered to-day in kitchens and catering establishments that fluorescent lighting is more efficient and cheaper than filament (tungsten) lighting.

Ventilation

Good ventilation assists in keeping high staff morale and also contributes substantially in keeping foodstuffs in good condition. A cool dry atmosphere is greatly to be desired and a humid hot atmosphere to be avoided as far as possible.

Ventilation is materially simplified if wind operated exhausters can be located on the roof. Steam, too, may be emitted through the roof without the necessity for long dust collecting ducts. The ducts when greasy can be a very real fire hazard.

Drainage

Waste liquids from the kitchen are mainly from three sources:

(*a*) Soil water from vegetable preparation.
(*b*) Condensed steam from steaming equipment.
(*c*) Waste water from the wash-up.

The two latter items, of course, often contain considerable quantities of grease which, from the wash-up at least, will have a high bacterial count.

Cleaning will be greatly assisted if channels, tiled with glazed bricks, are provided in the kitchen floor. The Ministry of Works, in " Mechanical Installations," H.M.S.O., 1944, has suggested that, in the areas of those authorities where channels are prohibited, new bye-laws should be passed allowing their construction. In any case, their use appears to be permitted under Section 13, sub-section 1 (*b*) of the Food and Drugs Act, 1938.

The blocking of drains with portions of women's wearing apparel may be costly, and it is generally cheaper to install a gas-fired sanitary incinerator in women's cloakrooms.

It is important that a separate store is provided for vegetables, so that there is no contamination by soil of the dry goods store.

Equipment

Equipment, in addition to carrying out the work efficiently, should also be chosen for ease of maintenance and cleaning. Surfaces should be smooth and continuous with the elimination of sharp corners and dead ends. All thread should be outside, while coupling nuts must have ample clearance at least three times the width of the nut.

Finally, as far as humanly possible, all equipment should be of stainless steel. It will cost more in the first expenditure, but in the long run it will be much cheaper to maintain than bits and pieces made of wood and enamel.

Sinks

Stainless steel sinks are greatly to be preferred, with teak a poor second. Galvanized sinks are hygienically unsound and their use should be avoided wherever possible.

Sanitary Conveniences

It is an offence against Section 13, sub-section 1 (*a*) of the Food and Drugs Act to permit any sanitary convenience to open directly into any place where food is prepared or served.

In order to supply food under the most hygienic conditions, it is essential that it should be handled as little as possible. As a consequence, every catering establishment must have the maximum of mechanical aids if it is to be operated economically. Prior to the war only the largest establishments were mechanically equipped, but in all places catering for more than 150 people a day more mechanical assistance is essential if food is to be produced with the minimum risk of food poisoning.

Equipment

Even the smallest cafés cannot possibly consider peeling potatoes by hand, and a 14-lb. load machine electrically operated will prove a boon and a blessing. In establishments serving more than 400 people, a 28-lb. load machine is certainly desirable. While for 750 people or more, two 28-lb. load machines will prove a sound investment. In a large establishment one cannot afford to have all one's eggs or potatoes in one basket.

Unfortunately, with some types of electrical kitchen

equipment, manufacturers appear to make the most extravagant claims for output. British manufacturers, generally, do not appear to have succeeded in producing steel blades for a chipping machine sufficiently keen and strong to cut large quantities of carrots and swedes or to overcome the corrosive effect of potato juice.

An electrically operated gravity feed meat slicing machine will reduce handling to a minimum. These electric motors should have three-phase winding wherever it is possible to install them. This type will not burn out as easily as single-phase motors, particularly when being started up by careless or " ham-handed " people.

An electric mincing machine is a good investment in the large establishment. There is little doubt that the initial cost will be more than covered by the saving of food in a comparatively short period.

Nowhere, however, can handling of food be reduced more than by the use of a bread buttering and slicing machine. A bread and buttering machine, although rather expensive, is capable of cutting and buttering 4,000 pieces of bread an hour. A most efficient and inexpensive bread roll slicer with a totally guarded blade is now available. It has a simple design and so can be maintained cheaply.

The establishment bakery has to compete on a price and quality level with commercial bakeries. It can be done and the bakery department can cover its operating costs and even have a margin over. The margin will depend on efficient operating, and for that considerable mechanical equipment is essential.

Mixing machines are subject to heavy usage and consequently heavy wear and tear. Machines of less

than 30 quarts capacity are not recommended particularly as their first cost is not considerably less than the 30 quart machine. In addition maintenance costs on the lower capacity machines are always appreciably higher than on the more robustly constructed machines.

Jam tarts are always very popular. They can be made more hygienically and more cheaply by the use of a tart stamping machine than by manual methods.

The cost of cleaning equipment largely depends on the type of kitchen equipment which has been installed. If there are plenty of wooden tables with much scrubbing and galvanized sinks it is only natural that labour costs for cleaning will be high. Stainless steel, because it may be kept clean at such a low cost, is obviously a sound investment. Stainless steel kitchen equipment and utensils are becoming more popular every day because they greatly assist in the production of clean food. Electric scrubbing machines are now available for floor cleaning. These machines dispense with a lot of dry sweeping and the resulting showers of dust falling on any exposed food.

All sandwiches should be prepared under hygienic conditions. It is no use, however, preparing them under excellent conditions and then allowing them to be sold under bad conditions.

Display stands should be provided for all sandwiches. These should be constructed of stainless steel or chromium and glass. Wood and glass display cases, particularly with plywood sides and back, attract insect pests and therefore should be avoided. The price at which food is sold is obviously a major factor in whether this type of equipment is installed or not.

In recent years a great deal of attention has been

paid to the wrapping of sandwiches in cellophane at the production point. Unfortunately, owing to the low price obtained for sandwiches generally, most canteens have been unable to afford the additional expense. Cellophane packing for sandwiches is most desirable, but it will put the production cost of the sandwich up by at least one-third. It should be remembered that in addition to the cost of the cellophane there is also a considerable extra labour cost for packing.

Stainless steel will take a mirror-like polish giving the outside of equipment a most attractive appearance; while employees appreciate the ease with which the material can be cleaned. The stainless steel commonly used for kitchen equipment consists of 18 per cent. chromium, 8 per cent. nickel and 74 per cent. low carbon steel. Stainless steel is protected from corrosion by the film of chromium oxide which is always present.

Sometimes chrome-nickel alloy is used. This contains approximately 13 per cent. chromium, 80 per cent. nickel and 7 per cent. steel. It can be worked more easily than stainless steel and therefore for some purposes it may be preferred.

The Manufactured Meat Products Working Party (1950) has stated under Section 115 that "The least satisfactory kinds of equipment are galvanized containers and wooden tables."

The Manufactured Meat Products Working Party has suggested that birds can cause contamination. I feel that it should be stated in places where birds are likely to gain entry that generally conditions are likely to be unsatisfactory. Therefore as a lesser of two evils,

in my opinion, birds are to be preferred to considerable scrap food on the floor.

I was in a catering establishment the other day, and I happened to be with a canteen manageress when a lady came up and said, " There's lipstick on this cup." Incidentally she looked as though she had been eating strawberry jam with a very large spoon. She didn't know, of course, that practically every canteen used by women has to wash every cup twice, once in the washing machine and once by hand every time the cup is used, just because of the tremendous amount of lipstick. Unless the lipstick problem is reduced, I think that within a comparatively short period paper cups will be in universal use and that will mean that the price of tea will have to be raised. The lady in question, like the majority of people using canteens, had no knowledge of what precautions are being taken.

It is now generally recognized that manual washing methods in catering establishments are inefficient, costly and wasteful in material. There are a number of remarkable dish-washing machines on the market which will save time and money for all but the very smallest establishments. It has been suggested to me on more than one occasion that mechanical dish-washing does not pay in the small establishment. Personally, I do not agree with that opinion, as the small gas operated machines can be very satisfactory where the catering is for small numbers of people.

Certain basic principles apply to all dish-washing machines as follows:

(*a*) It is essential to install dial thermometers to record up to 180° F.

(*b*) Plate and cup racks must be masked as little as possible during the washing process.

(*c*) Overcrowding of the racks prevents efficient washing.

(*d*) A sufficient number of racks must be provided for maximum load conditions.

Where large dish-washing machines are in use an efficient vapour extract trunking must be installed, and it is often most desirable in some small canteens because of structural reasons. The tank brush types of washing machine do not appear to be very popular. I am convinced that all types of automatic dish-washing machines, provided they are reasonably efficiently operated, reduce china breakage, when compared with manual washing up without mechanical assistance. Machine washing is, of course, quicker than washing up by hand.

A detergent is a chemical compound which when dissolved in water is used to remove food residue from eating utensils and equipment. The most commonly used detergent is soap; and its popularity is probably mainly due to the fact that it is not injurious to the hands. It has long been known that soap has only limited detergent properties.

Detergents

A detergent should have the following properties:

(*a*) The chemical power to " wet " the utensil so that the " wash water " penetrates between the food residue, and the utensil and the food residue therefore is washed.

(*b*) The chemical power to cause the food residue to dissolve in water.

(*c*) The power to emulsify all fats left on the utensil.
(*d*) The power to prevent the formation of insoluble calcium and magnesium salts. This is particularly important in hard water districts.
(*e*) The property which will allow the surplus detergent in solution to be freely rinsed off the utensil in cold water.
(*f*) The absence of any corrosive element.

Detergents are, of course, cleaning materials. They have been in use for at least 1,800 years; but it is only since the war that the new petroleum based detergents have really begun to replace soap. Soap is really only efficient as a cleanser in soft warm water, as in hard water a sticky scum will form on the surface. Hard water is caused by the presence of magnesium and calcium salts. These salts destroy the soap and in doing so form scum.

The petroleum based detergents are equally effective in both hard and soft water. Their action, without scum formation, provides better washing up with a brighter finish on the cleaned articles. They are also particularly effective for cleaning greasy walls, greasy floors and cooking pots. Undoubtedly the new petroleum based detergents are rapidly excluding soap from commercial kitchens. It is interesting to note that soapless detergents must be used, by Federal Law, on paintwork in commercial kitchens in America.

In this country these detergents are being manufactured by Irano Products Limited and Shell Chemicals Limited, under the trademarks " By-Prox " and " Teepol." In connection with the practical tests on these detergents the quantities of detergent recommended by Irano Products Limited is as follows:

Dish-washing by hand

1 tablespoonful By-Prox per gallon of water.

Floors and Tiles (by hand)

1 tablespoonful per gallon warm water.

Floors and Tiles (by machine)

2 tablespoonfuls per gallon warm water.

Paintwork and Walls

1 Tablespoonful per gallon warm water.

Cooking pots

1 tablespoonful per gallon hot water.

Roasting Pans

Add a tablespoonful of By-Prox to water in the pan and a little washing soda. Bring to the boil. All grease is thus removed.

The new detergents will wash cleaner and save time, trouble and bad temper.

Dr. B. R. Frisby in the *Monthly Bulletin of the Ministry of Health* (January, 1950, Vol. 9) gives some interesting results of research into the " Use of Detergents and Chemical Sterilizing Methods for Washing-up." The experiments were carried out in a small canteen serving only 270 hot meals. He found that washing-up with a hypochlorite solution was effective, but that the canteen staff disliked the white stains on their uniforms caused by splashes of the diluted solution. He also found that washing-up with hot water and washing soda was almost a complete failure. When soda was being used it was found that the presence of fæcal coli, both in the water and on the utensils, was very high. He also points out the risk of using dirty tea towels and suggests that a better bacteriological result is obtained by simply allowing the plates to drain. It is pointed out that a hypo-

chlorite solution is not suitable for use with poor quality cutlery.

In common with other observers he found that washing-up water, when used in manual operation, was never very hot. The maximum temperature found during the tests was only 52° C. and was usually about 45° F.

Mallinan, de Koning and Zaikowski published a Critical Study of Machine Dish-washing in the *American Journal of Public Health* (April, 1947, Vol. 37. pp. 390–9). They noticed that " used beverage glasses carry streptococci which are frequently pathogenic, which is indicative of the presence of many other pathogenic bacteria and viruses." They found that the conveyor type gave better results than the immersion type or manually operated dish-washing machines.

Hyman J. Kleinfeld and Leon Buchbinder reported, in the *American Journal of Public Health* (April, 1947, Vol. 37, pp. 379–89) on a survey of dish-washing practices in 1,005 New York restaurants. They noticed that machine washing of glasses and cups was far more efficient than manual methods, although there appeared to be no significant difference between mechanical and manual methods with cutlery. It was apparent, however, that when a special cutlery machine was in operation, the standard of cleanliness was greatly superior to other methods. The general commercial standard of dish-washing practice and accomplishment in this survey is, on the whole, rather dismal.

This is probably generally true of commercial washing-up conditions in the United Kingdom. The general standard of glass washing in public houses and clubs is, in general, deplorable.

In New York the Health Department has set up and is enforcing standards for dish-washing machines. A single tank door type machine using a 20 by 20 rack must pour a minimum of seventy gallons of warm detergent solution on a rack of dishes during the washing period. An automatic power conveyor machine, both for single tank and multiple tank types, must pour a minimum of twenty-four gallons of wash water per foot of conveyor travel, and not less than forty-five gallons for the period of time required for any one dish to remain in the wash spray. It is estimated that under these conditions each plate remains in the machine for fifty seconds. The above requirements are for the washing phase. Similar requirements are required during the rinsing phase. Valves on dish-washing machines must be painted in the following distinctive colours and also tagged by a name plate:

Red for steam.
Yellow for hot water.
White for cold water.
Blue for drain.

In addition, the dish-washing machine must be provided with a detergent dispenser which "will maintain adequate concentration of detergent in the wash tank at all times during the operation."

It is important that proper cleaning materials should be chosen. They should be efficient, and compounds likely to cause dermatitis should be strictly avoided. Complaints regarding cleaning materials should be regarded very seriously.

Cleaning operations are better if carried out with the maximum of mechanical assistance. Floor scrub-

bing by hand is, in these days, an unnecessary luxury in both labour and materials. Persons obviously cannot scrub on their hands and knees without interruption for long periods. In addition, women engaged mainly on scrubbing suffer from skin ailments of the hands, causing absenteeism and dislocation of work schedules.

The morale of cleaners is generally not very high, and therefore it is important that whenever possible steps should be taken to improve the position. Cleaners should be made to feel that they are part of a team of the whole department. If control of cleaners is exercised from outside the department it is probable that the team spirit, so far as they are concerned, will never be very high. In some cases, of course, certain cleaners will not be spending their whole time in one department but their day will be split into two or three departments. In those cases control is, of course, far more difficult.

In the United States legislation has been enacted in most States for a high standard of sanitary facilities. It should be remembered that, both in canteens and restaurants, prices are considerably higher in the United States than in this country. This results in a higher gross profit and therefore higher overheads may be carried by the establishment in the U.S.A.

Wherever possible every catering establishment should have an incinerator for burning rubbish. It is important in order to prevent the accumulation of flies and the encouragement of rodents that all empty food tins should be burnt. Rubbish should only be removed in those places where burning is quite impossible.

CHAPTER XII

BOTULISM

BOTULISM is caused by the poisons (toxins) produced by *Clostridium botulinum*. The classic example which occurred in this country is the Loch Maree outbreak. This happened at an hotel at Loch Maree, Gairloch, Ross-shire, in August, 1922, when eight people died. On August 14th eight people, resident at the hotel, lunched on sandwiches made with potted paste. About eighteen hours intervened before the first symptoms were observed, but the acute stage developed rapidly. Two ladies died on August 15th, two men on August 16th, two more on August 17th, and the last two affected persons succumbed on August 21st. The potted paste had been manufactured by a well-known firm, but unfortunately the reason for the infection was never discovered. Symptoms of botulism were produced, however, in experimental animals which had been fed on a portion of the unconsumed paste.

The toxins of *Cl. botulinum* develop only in conditions from which air is excluded (anaerobic). Most outbreaks have been traced to canned food and preserved meat. The death rate from infection has varied in different outbreaks from 25 to 100 per cent. Fortunately, meat gives off a foul evil-smelling odour as a result of the growth of *Cl. botulinum*. As a result, meat which might cause botulism is usually thrown away before it can do any damage. There has been a lot of trouble, however, with home-canned vegetables in the United States, such as string beans, which have

poorer nutrient qualities for *Cl. botulinum*, and consequently the smell is not nearly so pronounced and may not be detected by an inexperienced person.

Botulism brings on nausea and vomiting within twenty-four hours. Diarrhœa may be a symptom in the early stages but in the later stages constipation may become acute before the fatal issue. Supplies of a protective serum are now held at many hospitals. Details can be obtained from the local Medical Officer of Health. Fortunately, cases do not prove fatal unless the mucous membrane of the intestine is penetrated. If the membrane is not penetrated, the cases are usually mild in character. I strongly recommend that catering establishments should not attempt to carry out any canning process, but that all tinned goods should be purchased from a reputable manufacturer. It would certainly appear that a canteen, being part of a factory, must conform to all the regulations relating to canning factories, if canning operations are carried on.

CHAPTER XIII

SALMONELLA POISONING

The salmonella bacteria are all related to each other but they may be identified by cultural tests. The Salmonella group of bacteria are capable of producing poisonous toxic substances but unfortunately little is yet known of their exact nature. An outbreak of food poisoning occurred in Edinburgh during 1926. Although no living salmonella bacteria could be isolated from the cooked food, they were found in a part of the uncooked mutton. It was, therefore, presumed in this and other similar cases that the poisoning was caused by toxins produced by the salmonella bacteria.

Usually an attack of salmonella poisoning comes on rapidly, commencing with stomach pains, followed by vomiting and diarrhœa. In the most acute stages the stools are watery and of a greenish colour. The breath is repulsive and the tongue heavily coated. The symptoms of salmonella poisoning never develop sooner than five hours after the food has been eaten, while generally twelve hours elapse before the patient feels ill. It is some comfort, however, to know that salmonella poisoning causes a mortality of little more than 1 per cent. of all affected cases.

It should be remembered that all bacteria must have a suitable medium in which to grow. Meats which have been made up (such as brawn, faggots, meat pies and potted pies), cooked and then allowed to cool slowly give bacteria ideal breeding conditions:

It is dangerous to use any meat pies which are more than two days old.

There are several methods by which food may be infected by salmonella bacteria:

(1) Meat from a diseased animal.
(2) Milk from an infected animal.
(3) Infected duck eggs.
(4) Infection by rats and mice.
(5) Infection by flies.

The Chief Medical Officer of the Minister of Health in his report for 1937 noted a serious outbreak of 148 cases and four deaths from *Salmonella enteritiditis* caused by manufactured meat products from a single factory. Apparently the whole trouble was caused by a single Salmonella infected pig carcase. Another serious outbreak of factory origin occurred in 1938 at Exeter which involved fifty people. Brawn which had been in contact with calves suffering from calf dysentery, was the source of the trouble. *Salmonella enteritiditis* (Dublin) was isolated from the sufferers, the brawn and the calves.

In most years serious outbreaks of food poisoning have been caused by salmonellæ. In 1949, 200 persons were poisoned by infected duck eggs at St. Bartholomew's Hospital, London.

Milk infected by salmonella bacteria caused an outbreak among 165 persons at Bradford in May, 1949; while another salmonella outbreak occurred through milk in Yorkshire, during July, 1949, when 332 children were ill at school.

The danger of meat pies cooked several days before being sold was once again demonstrated at Prestatyn during September, 1949. Sixteen people were

violently ill. *Salmonella typhimurium* was isolated in all the cases.

Salmonella newport caused the poisoning of seventy hotel guests at Skipton in July, 1949. It was traced to badly prepared ice-cream.

CHAPTER XIV

STAPHYLOCOCCUS POISONING

STAPHYLOCOCCUS poisoning comes on usually about three hours after the infected food has been eaten. The foods usually involved are cured meat, flour confectionery (pastries, etc.) and milk.

Staphylococci are commonly present in the nose and throat during and after the common cold. They may cause skin troubles and may also be isolated from the air. It is the toxins produced by the staphylococcus, however, which causes the poisoning. These are produced in warm humid conditions. Temperatures above 50° F. must be considered dangerous for all foodstuffs on which they thrive. The toxins do not cause any external change in the appearance of the food, so that foodstuffs in unhygienic conditions, although appearing normal, may be highly dangerous. There is a great deal more to be learnt regarding these toxins than we know at the present time, but it is known that they do not develop in scrupulously clean conditions.

Some investigators have suggested that there has been considerable confusion by people studying the problem between staphylococcal and salmonella poisoning. Some types of staphylococci are capable of producing toxins which are highly dangerous to man. Jordon in 1931 was the first investigator to give the group much serious study, while he pointed out the complexities of the task. He suggested that various food poisoning outbreaks, where it was not possible to

identify the origin, may have been caused by these toxins. Dack has noticed that these toxins may have been neglected because of the publicity given to salmonella.

There is no doubt that insufficient attention has been paid to them by many health authorities in this country, although intensive research has been conducted in Canada and the United States.

Cream-filled pastries appear to be commonly attacked by these bacteria and their toxins. Between 1935 and 1939, in New York State alone, 1,227 cases were actually identified and in every case cream-filled pastries were the infected food. Cream pastries are often stored in warm conditions in storerooms, shops and shop windows. These are ideal conditions for bacteria in which to thrive. Kelly and Dack (1936) have pointed out the risk of staphylococcal poisoning in the consumption of ham sandwiches after being kept at room temperature for eighteen hours. Fortunately, however, the mortality rate from staphylococcus poisoning is very low. Only Finnel (1856), Deny (1894), Blackman (1935) and Dorling (1942) have recorded fatalities from this cause.

In July, 1949, *Staphylococcus aureus* was isolated from thirty persons in an hotel at Irlam. The poisoning was traced to boiled tongue and to the individual who had prepared it.

The dangers of infection from a butcher suffering with chronic dermatitis was again proved in Sheffield. Eleven persons became violently ill after eating rabbit purchased at the particular shop. *Staphylococcus aureus* was again identified.

Sandwiches "filled" with a meat product must

not be allowed to remain at a temperature exceeding 50° F. for more than four hours. Staphylococci multiply rapidly in most "fillers" at temperatures above 50° F. In some outbreaks the cocci may not only multiply in the "filler" but also be sufficiently numerous to infect the bread. Sandwiches should never be kept moist by the use of a damp cloth, as this will only encourage the growth of the micro-organisms, particularly in meat products.

CHAPTER XV

METALLIC POISONING

In the past there have been serious outbreaks of metallic poisoning, but the total prohibition by law of many harmful metals in foods, during recent years, has made this country a much safer place to live in. Even in the best factories, however, accidents sometimes happen, such as the outbreak at Stoke-on-Trent, which was the result of sweets being accidentally dusted with arsenious oxide in mistake for sugar.

In the United States it may be of interest to note that metals in food are restricted to the following proportions:

Copper 30 per million Sulphur dioxide 350 per million.

Lead 20 per million Arsenious oxide 1·4 per million.

Zinc 100 per million.

Metallic contamination has been found, in appreciable quantities, on occasions in gelatine. It is, therefore, recommended that purchases should only be made from reputable firms.

It is important, however, that metallic poisoning should be kept in its proper perspective, as only ten out of 3,270 outbreaks between 1937 and 1946 were due to metallic poisoning. Zinc accounted for at least half of the reported cases.

Metals may be accidentally introduced into food by three ways:

(1) Pollution of the food by a solution having a metal content.

(2) Metal, in powder form, introduced into the food.
(3) The use of sprays, containing metals such as arsenic, on fruit to prevent damage by insect pests in orchards.

Arsenic

One of the most serious outbreaks of food poisoning in modern times occurred during 1900 in parts of Lancashire, Cheshire and Staffordshire. Seventy people died and some 6,000 persons were poisoned by arsenic in beer. At one time it was common for sugar confectionery to be tinted with colours having an arsenic base. Under the Public Health (Preservatives in Food) Regulations, 1925, the use of any colouring containing arsenic is forbidden in all foodstuffs.

W. D. MacNally has described in *Industrial Medicine*, U.S.A., a case of a banquet in Chicago when arsenic trioxide was maliciously added to soup. Fortunately, such cases are very rare.

Arsenical poisoning is seldom caused by food, as it is generally met with as an industrial disease; but it is sometimes found as a result of the administration of excessive amounts of drugs containing arsenic administered for the purpose of curing certain diseases.

Antimony

Antimony is seldom the reason for food poisoning, and then only as the result of gross ignorance and neglect. The use of cheap enamelled ware must be considered a grave danger. In recent years three serious outbreaks have occurred in this country as a result of making lemonade from lemonade crystals prepared or

stored in enamel jugs. It would appear that dangerous amounts of antimony were dissolved from the enamel ware causing a considerable number of cases of illness.

During Christmas, 1932, a party was held at a London hospital when sixty-five persons were poisoned by lemonade made in enamel jugs. It is suggested that enamel ware should not be used in catering establishments, as stainless steel or aluminium ware is safer and more durable. WRONG.

Cadmium

Most cases of cadmium poisoning have been caused by the accidental contamination of acid food and drinks with soluble cadmium compounds. Ice-trays in some refrigerators, in the past, have been cadmium plated. Unfortunately, if acid food or drink are placed in such trays, some of the cadmium will dissolve, thus causing cadmium poisoning to anyone eating or drinking the food.

Zinc

The great reduction in the use of galvanized utensils in catering establishments has greatly reduced the possibility of zinc poisoning. Acid foods, however, do dissolve large quantities of metal from galvanized utensils. An outbreak of 200 cases occurred in Surrey during 1922 as a result of stewing apples in galvanized utensils. Another outbreak from a similar cause occurred during 1943 at Hereford, while 200 persons were poisoned for a similar reason in Norfolk during 1944. It is quite obvious that galvanized containers must never be used in any catering establishments for use as cooking utensils.

During 1949 two serious outbreaks occurred as a result of the use of zinc baths in school canteens. In the first case bilberry juice was poured into zinc baths overnight and then made into jellies. One hundred children were affected. The remains of the jelly was found to contain a zinc content of 200 parts per million.

In the second case, fruit salad was stored in a zinc bath for twenty hours, and as a result 250 children were violently ill. The fruit salad had a zinc content of 260 parts per million.

Copper

It was formerly the custom to add salts of copper to almost all foodstuffs of green colouring in order to brighten the appearance. During the eighteenth century many housewives boiled halfpence with green vegetables when pickling them. Since the Public Health (Preservatives in Food) Regulations, 1925, became operative the addition of salts of copper to foodstuffs has been totally prohibited. Unfortunately, on the Continent, salts of copper are still added, sometimes as high as fifty parts per million, in canned peas and canned beans. For this reason continental canned green vegetables, if very bright in colour, should be regarded with suspicion.

Dickson has reported an outbreak of forty-two cases caused by boiling dried peas in a copper. Some of the tinning had worn away from the interior of the copper leaving the exposed metal. The cooking of food in copper pots which have a worn lining of tin cannot be too strongly deprecated. Undoubtedly, cooks often run grave risks with copper consommé pans requiring

re-tinning. Too often one hears the old story that " we are short of cooking pots," but that is hardly a reasonable excuse for risking the health of a large number of people.

The dangers of copper urns in a bad state of repair, when used for tea making, was pointed out by Dr. Griffin in the *Journal of the Royal Sanitary Institute*, January, 1951. He reported cases of copper poisoning which had occurred at a transport club in the Midlands. Six people were affected, of whom two were violently ill. It was apparent from the report that a copper deposit was actually in the served tea apparently because of naked copper inside the urn. It was obvious that copper urns can be very dangerous if they are not kept in a good state of repair.

Lead

Lead is one of those substances which is a cumulative poison. Lead, once it enters the body, even in small quantities, will not leave it. There is ample proof that lead is absorbed by the body more rapidly when it is present in a liquid form than when it is present in a solid type of food, e.g., lead from pipes dissolved in beer is extremely dangerous.

In 1922 ninety-three cases, with one death, took place in Middlesex as a result of lead being dissolved from the enamel linings of beer tanks. Beer was the agent of another serious outbreak in a London borough during 1936.

When lead foil is used for wrapping cheese and confectionery the manufacturer always uses internal wrapping of paper to prevent the lead coming into contact with the food. The Ministry of Health has

pointed out the danger of the contamination by the use of lead-lined tea chests. Most English tea packing houses are now using paper as a lining to their tea chests. The Port Sanitary Authorities have been active in condemning considerable quantities of canned fish containing excessive lead content.

Lead is now totally prohibited as a colouring matter in all foodstuffs under the powers of the Public Health (Preservatives in Food) Regulations, 1925.

In the United States, solder used in eating establishments, must not contain more than 5 per cent. lead. The other 95 per cent. must be composed of pure tin. Apparently the occupier of an eating establishment is liable if a contractor, doing maintenance work in the establishment, uses solder containing more than 5 per cent. lead.

Cyanide

Cutlery, when dipped in a solution containing cyanide, comes out clean and shining, but this must be considered a dangerous practice, as if any cyanide residue remains on the cutlery it may cause serious poisoning. In the United States cyanide is totally prohibited as an ingredient of cutlery cleansing materials.

Fumigation by means of cyanide against insect pests may contaminate foodstuffs. In the City of New York cyanide may not be used for fumigation except by a licensed operator under a special permit and under the direct supervision of the Health Department. The regulations in the United States regarding cyanide fumigation are so severe that now this method is only used on board ship and in covered railway trucks.

Iron and Tin

Iron and tin do not cause poisoning, but iron vessels, as apart from stainless steel, are extremely difficult to keep clean.

Sodium Fluoride

Sodium fluoride closely resembles baking powder in appearance, but it is a most dangerous poison. A dose as low as 3 gm. will be lethal to man. It must never be used therefore in a kitchen or a bakehouse as an insecticide because of the grave risk of confusion with baking powder. It must be clearly stated that even very small doses of sodium fluoride will cause death within twelve hours. The Fluoride in Food Order, 1947, lays down maximum limits of fluoride in food. Generally it may be stated that the maximum permitted amount is 300 parts per million.

An extensive outbreak of sodium fluoride poisoning took place in a hospital at Salem, Oregon. Some 17 lb. of insect powder was mistakenly added instead of milk powder to scrambled eggs. Forty-seven people died as a direct result, while more than 200 other persons became ill but recovered.

Methyl Chloride

Some gases used in refrigeration are deadly. Methyl chloride is probably the most dangerous. In 1929 ten deaths occurred from this cause in Chicago.

Prohibited Chemicals in Food

In the United States, under the powers of the Food and Drugs Act, 1906, the following chemicals are totally prohibited in food:

Borax.
Boric acid.
Formaldehyde.
Salicylic acid.
Potassium permanganate.
Sulphurous acid.
Hydrogen peroxide.

Colours in Foodstuffs

Under the Food and Drugs Act, 1938, the use of colours is somewhat ill-defined. In some other countries, particularly the United States, far greater detail is given regarding what may be used and what may not be used.

It would appear from the British Regulations that any colour may legally be used with foodstuffs, provided it contains not more than 1·4 parts per million of arsenic as oxide, as this can be proved to be harmless.

In this country research on colours for foodstuffs has been carried out on a large scale by the Dyestuffs Division of Imperial Chemical Industries Limited. This research has resulted in the well-known range of colours with the trade mark " Edicol."

The Public Health (Preservatives in Food) Regulations, 1925, totally prohibits the use, in foodstuffs, of the following colours:

Picric acid	also known as Carbazotic acid.
Victoria yellow	also known as Saffron substitute.
Manchester yellow	also known as Naphthol yellow or Martinus yellow.
Aurantia	also known as Imperial yellow.
Aurine	also known as Rosolic acid.

In this group the nitro compounds are prominent, but another nitro compound, naphthol yellow S, has always been permitted for use as a food colouring in this country, and also, incidentally, in the United States.

Richardson, in the *Journal of the Society of Dyers and Colourists*, 1923, has stated that the nitro groups of colours are generally harmful but the sulphonic acid group is not dangerous.

Colours in common use in England are rosin, naphthol yellow S, malachite green, ponceau red, rosanalines, tartrazines and rhodamines.

Cox has noticed that the following organic colours may be legally used in the United States and Canada:

Red Shades	Yellow Shades
184 Amaranth.	10 Naphthol yellow S.
80 Poncean 3R.	640 Tartrazine.
773 Erythrosin.	22 Yellow O.B.
	61 Yellow A.B.

Orange Shade	Blue Shade
150 Orange 1.	1180 Indigo carmine di-sulphonic acid.

Green Shades

666 Guinea Green B.
670 Light Green S.F. yellowish.
— Fast Green F.C.F.

The identification numbers are those of the colour index compiled by the Society of Dyers and Colourists.

Preservatives in food are now strictly controlled, but under powers of the Public Health (Preservatives in

Food) Regulations, 1926, 1927, 1940, sulphur dioxide may be added to:

Sausages	450 parts per million.
Fruit pulp	1,500 parts per million.
Raisins and sultanas	750 parts per million.
Jam	40 parts per million.
Sugar	70 parts per million.
Cornflour	100 parts per million.
Gelatine	1,000 parts per million.
Pickles	250 parts per million.

CHAPTER XVI

RATS AND MICE

The rat is probably the most dangerous animal to public health in Britain. Besides destroying large quantities of food, they also spoil far greater amounts by burrowing, gnawing and by the dropping of their excreta. The risk from the excreta is considerable, as rats are serious carriers of disease.

There are two types of rats in Britain, the black rat (*Rattus rattus*) and the brown rat (*Rattus norvegicus*). Colour is not, however, an infallible guide, as some brown rats are *Rattus rattus*, while some black rats are *Rattus norvegicus*. It was the black rat, as the carrier of plague bacillus, which was the cause of the widespread misery of the Black Death during the Middle Ages.

The Ministry of Agriculture and Fisheries, in that excellent brochure "Rats and Their Destruction," Bulletin No. 30, 1946, has given the following table of differences between the two types of rat:

Black Rat (*Rattus rattus*)	Brown Rat (*Rattus norvegicus*)
Smaller, of slim build with sharp muzzle.	Larger, of heavier build with blunt muzzle.
Ears large, naked, almost translucent, meeting when pressed across the head.	Ears small, hairy, thick, not meeting when pressed across the top of the head.
Tail slender, at least as long as head and body.	Tail stout, never so long as head and body.
Pads on soles of feet relatively large.	Pads on feet relatively small.
Many slender, grooved bristles in the soft fur. Usually ten teats.	Grooved bristles, fewer and more slender. Usually twelve teats.
Adult weight rarely over 8 oz.	Adult weight normally 14–17 oz.

It will be seen, therefore, that all large rats are brown rats. The old story of a rat as big as a cat I simply do not believe, as I have certainly never seen one anything like as big.

It is possible for a female rat to have about thirteen litters or 180 immediate descendants in a year. In the past, attention has been focused largely on killing rats, but to-day considerable attention is being paid to preventative methods. In the places which the brown rat is known to frequent, care must be taken to ensure that drains are not defective. Brown rats probably gain entrance to buildings more often because of the defective drains than any other single reason. All starchy foods should be stored whenever possible in metal or concrete bins which must have tightly fitting lids.

The presence of rats may be suspected by the classical signs. These are:

(*a*) Runways.

(*b*) Smear marks on walls and particularly on beams or ladders. The rat's fur is always greasy, which will mark any object which it touches regularly.

(*c*) Gnawing marks, including holes.

(*d*) Excreta and fouling of food.

The benefit of having a cat in a kitchen for the purpose of keeping rats away more than offsets any disadvantages provided, of course, that it is a reasonably clean one.

There are many types of rat poisons, but they should be chosen with care, as some are by no means harmless to human beings and domestic animals. Personally, I regard Dak as a particularly satisfactory bait. It is a sticky substance which is stuck on wooden boards. These boards, about a foot square, are placed

in the places which are known to be frequented. Once a rat has put one foot on the Dak it will never get off alive. In order to attract the rat, a bait must be placed in the centre of the Dak, but this need not be poisoned. Dak is therefore an effective non-poisonous bait which does not repel the rat by smell.

Red squill is not a poison within the meaning of the Pharmacy and Poisons Act, 1933, and is probably one of the safest rat poisons for use by persons who have not had advanced technical training. It is manufactured from a dried bulb called *Urginea Maritima*, which is normally obtained from the Mediterranean region, but has been grown with some success in California.

It is claimed that it is completely harmless to human beings and other animals. I do not know if the claim can be completely substantiated. It is certainly a less dangerous bait, however, than arsenic, zinc sulphide or phosphorus. The latter baits may only be purchased in accordance with the terms of the Pharmacy and Poisons Act, 1933. These baits are so dangerous and so many accidents have occurred as a result of their being carelessly used that, in my opinion, permission should only be granted for their use on food premises when all other methods have failed. I do not propose, therefore, to describe methods for their use.

Rats and mice often live for considerable periods after infection by salmonella bacteria. Food left exposed to these rodents may be affected by their excretions. The enteritiditis type is usually found in the rat and typi-murium in the mouse.

Anyone using the so-called virus type of rat poison in a catering establishment is taking a very serious risk, as these poisons can have serious effects on the health

of human beings. There was a death from food poisoning and thirty-eight other cases caused by the use of a bacterial poison in Wejan in November, 1931. A mouse had taken some of the germ and had afterwards infected food with the infection in the organism (*Bacillus enteritidis*). The word " virus " is used in this connection to designate a living virulent micro-organism. Parangothy, working in Malaya, has reported that bacterial poisoning is an inefficient method of killing rats.

The Federal Insecticide, Fungicide and Rodenticide Act, 1947, lays the obligation on occupiers of premises in the United States in regard to rat control.

Jordon, during 1931, gave the first serious warning of the danger of food poisoning by the use of rat viruses on food premises. Jordon was strong in his denunciation of these viruses, as he goes on to say:

" the method has not proved of material value in the destruction of rodents."

In 1941, Leslie identified six well-known " makes " of rat virus—four belonged to *Salmonella danysz* and two to *Salmonella enteritidis*.

In the United States, Spray has shown the folly of using rat " virus " on food premises. He investigated 135 cases of poisoning caused by milk infected in a kitchen by rat virus.

Poisons such as barium carbonate and sodium arsenite are now seldom used by experienced operators. Although phosphorus has been widely used in commercial rat poisons, it must be regarded as a highly dangerous bait, as there is no effective antidote.

A.N.T.U. (alpa-naphthyl-thiouren) must be re-

garded as dangerous to life unless used with the greatest care by trained operators. 1080 (sodium fluoacetate) is now being manufactured as a result of research by the Fish and Wildlife Services of the United States.

An interesting report on A.N.T.U. is given by J. T. Emlen in the *American Journal of Public Health* (June, 1947, Vol. 37, pp. 721–7). The report deals with rat control in Baltimore, U.S.A., a city of 800,000 inhabitants. After certain field experiments the work was re-organized as a Division of the Bureau of Street Cleaning on January 1st, 1945. Most of the work was done by volunteers, of whom there were more than 2,000, by the end of 1945. And they had treated the amazing total of 4,160 city blocks, and had used 100,000 lb. of poisoned bait.

The rat population consisted almost exclusively of the brown rat (*Rattus norvegicus*) and was believed to be about seventy-five rats per block. By marking rats, it was found that each block was an independent unit isolated from other blocks. The control was organized through a system of block teams each under a leader. The bait used was a 3 per cent. A.N.T.U. in finely-ground corn, but it was not found necessary or more effective to pre-bait.

Rats died within two days of taking the poison and results were estimated by a count of the dead rats. It was found necessary generally to repeat the treatment once a year. During 1945 the scheme cost 44,000 U.S. dollars, mainly labour and materials. Generally, it was estimated that in most blocks the rat population had decreased by 95–85 per cent.

It is important, in all food establishments, that all poisonous powders are coloured by a powder dye to

prevent any confusion with baking powder, flour or dried milk.

In the five large salvage plants belonging to the Birmingham Corporation, 19,000 rats were destroyed during 1949. At one destruction 1,200 rats were killed by hand in two days.

In Cardiff, during 1949, 26,817 rats were destroyed in the sewers, but in Edinburgh during the same year only 7,312 were killed. In Liverpool disinfestation is carried out on the " block " system. All infested sites in the same area were dealt with at one and the same time by arrangements made under a previously planned time-table. By this system, 3,260 buildings were cleared of rodents, over 26,000 rats being killed by poison baits. The great majority of these were brown rats (*Rattus norvegicus*).

Dangerous poisons have been found to be very effective in the London sewers, but that is a different proposition from a catering establishment.

The trapping of rats is more effective than poisoning but it requires considerably more knowledge and skill. The most effective trap is the old-fashioned break back provided it is fitted with a sensitive trigger. Baits must be fresh when used and should be changed daily. Bread is a more effective bait for rats than cheese. Baits which are soft may be tied in thin cloth and bound on to the baiting hook with string. The break backs should be set along runs, so that the rat actually crosses the bait, for example, at right angles to a wall. Traps should be baited without setting for several days.

Then all the available traps should be set on the same night when a satisfactory result should be recorded. Intensive trapping on one or two nights is far

more likely to be successful than continuous trapping over a long period with a small number of traps.

Rat destruction by the very nature of the animals is only successful if an intensive campaign over a wide area is carried out as a result of co-ordinating arrangements.

An electric trap is manufactured in the United States by Electronic Traps Incorporated, Rochester, New York. The rat enters the runway beneath the trap and breaks an electric eye beam. This sets the doors at the end of the tunnel at both ends down. A small door in the side of the trap opens and the rat runs into an electrocution chamber. The trap automatically resets itself and has been found highly successful. In one factory eighty rats were killed in one night by a trap of this type.

International conferences on rats took place in 1928 and 1931. Undoubtedly these conferences did a great deal to assist in the international control of rats.

The greatest preventative to rats, however, is to deny access to food in as complete a manner as possible. A shortage of food will reduce immediately the number of rats on the premises and will seriously interrupt breeding. Hungry rats are easier to trap than well-fed ones.

The rat flea, *Xenopsylla cheopis*, is a dangerous insect, particularly as it may transmit bubonic plague. Usually it is only found on the black rat (*Rattus rattus*). If black rats are kept down to low limits there can be little danger of many rat fleas.

The most successful method of killing house mice (*Mus musculus*) is by means of a large number of break back traps set on the same night. In one club with

which I was at one time connected, I set one hundred traps every night. During the first week of the campaign we caught, baiting with cheese, an average of sixty mice a night. At the end of ten days the nightly bag had fallen to ten. By the end of the third week only two or three were killed each night, while the old familiar " scuttle " in the dark passages was no longer heard.

An electric mouse trap is also being manufactured in this country. It is called the Uranus and is produced by Robert Joliffe Trust, Aylesbury, Buckinghamshire. This small machine is plugged into 200/250 D.C. or A.C. power point. It is placed along the runs which it is known mice are using. The mice are electrocuted immediately they enter the trap, and it is claimed that it is quite harmless to domestic animals.

CHAPTER XVII

FLIES AND COCKROACHES

It was not until 1904 that Austin carried out research on the contamination of food by flies as part of an inquiry into the thousands of typhoid fever cases during the South African and the Spanish-American wars. In 1914 Graham Smith noted that flies infected with enteritidis had the bacillus in their crops for at least seven days after infection. There is no doubt that flies are a grave menace to health, and particularly by enteritidis.

The most important matter, in any campaign for fly prevention, is the elimination of breeding places. Clean kitchens and clean surroundings undoubtedly go a long way to keeping flies down to reasonable limits. Swill and rubbish bins must have tightly fitting lids. The bins must be removed outside the building as soon as possible, and in any case never later than the end of each shift.

Swill and rubbish bins must be removed from the catering establishment at least once daily. Receptacles used for exhausted tea leaves must be given particular attention, as these are dangerous breeding spots for flies.

All windows to food storage and preparation rooms should be screened against flies with a wire gauze of number ten mesh. The mesh should be fitted to frames, so that the complete frame may be lifted out while windows are being cleaned.

A special paint, A.F. 34, is now being manufactured

for use against flies. The paint, a strongly smelling white emulsion, should be placed on as many exposed surfaces as possible with particular attention to equipment, canopies and air ducts.

A.F.34, while being applied, gives off a poisonous vapour, so that foodstuffs must be removed from the room in which painting is being carried out. It is only effective on non-absorbent surfaces and is therefore quite useless on distemper or plaster. It must be applied at least every two months if a high standard of fly prevention is to be obtained.

If flies are very numerous it will be essential to apply anti-fly paint A.F.34 to external surfaces. Obviously the extent of re-painting will depend largely on weather conditions and the degree of exposure of the area concerned.

The house fly is the commonest insect found in kitchens, particularly in autumn and winter, when they move indoors for warmth and shelter.

Flies will breed on any dirt or rubbish, and they are particularly fond of heaps of discarded tea leaves presumably because they provide ideal conditions for the development of the larvæ.

The house fly has been dismissed lightly for far too long a period. Serious outbreaks of the following diseases have been directly attributed to house flies:

(*a*) Cholera.
(*b*) Infantile paralysis.
(*c*) Typhoid.
(*d*) Dysentery.

It is quite useless going round a kitchen swotting odd flies. The regular removal of swill and rubbish from

outside the catering establishment and regular cleaning of the kitchen with reliable detergents will do far more to remove this danger to health than all the fly papers which were ever manufactured.

The common cockroach (*Blatta orientalis*) is a frightful nuisance in any kitchen which it infests. It has a dark brown colour, but there are distinct differences in the appearance of the male and the female. Infestation largely depends on insanitary kitchens with cracks and crevices in which the insects can hide by day. At night they will overrun the kitchen and any food which is left uncovered. There appears to be no evidence that cockroaches are carriers of disease but it has been suggested that they do carry bacteria.

D.D.T. (Dichloro-diphenyl-trichlorethane) is likely to be the answer to most problems of insect pests in the kitchen. The first large-scale success of D.D.T. was at Naples during 1943. A serious outbreak of typhus occurred but intensive use of D.D.T. was made as a means of mass disinfestation.

One of the great advantages of D.D.T. is that it does not repel insects. All unsuspectingly they alight on surfaces which have been sprayed with it. The substance takes action through the feet of the insect and once contact has been made the insect is doomed.

D.D.T. is comparatively cheap to use, as it is never used in its pure condition but always as a constituent of a powder or liquid. All the principal companies manufacturing insecticides, under licences granted by the Geigy Company, now incorporate D.D.T. in their proprietary insecticides. In kitchens, D.D.T. is generally used in the spray type, but a powder must be used if it is intended to be used on soft furnishings,

The lethal effect of spraying is now known to last only a few days. It must therefore be renewed frequently.

Paper storage sacks used by some of the larger food manufacturing concerns are now impregnated by 10 per cent. D.D.T. to prevent damage by insect pests.

Satisfactory results have been obtained by incorporating D.D.T. in dry distemper for application to walls. It has been found, however, that D.D.T. is not effective if incorporated in oil paints or synthetic enamels. It is helpful to know that D.D.T. may be successfully incorporated in water-bound oil paints, as these give a durable coating with considerable decorative value.

It has been found that both head and body lice cannot survive if the infected person is treated with 10 per cent. D.D.T. powder.

Bedbugs

A 1 per cent. solution of D.D.T. in kerosene is generally considered to be successful against bedbugs.

Cockroaches

G. E. Gould in *Soap* (1943, Vol. 19, p. 119) reported that 20 per cent. D.D.T. dust gave excellent results against cockroaches.

Considerable attention has been given recently to the use of aerosols against cockroaches. Goodhue and Smith used an aerosol containing 5 per cent. D.D.T., 5 per cent. cyclohexanone, 5 per cent. lubricating oil (S.A.E.10), 5 per cent. acetone and 80 per cent. freon 12, which they found an excellent killer.

House Flies

D.D.T. in a solution of kerosene does not appear to be very satisfactory against house flies. It is certainly

better if used as ·03 per cent. prethins and 1 per cent. D.D.T. in a kerosene solution. The house fly, however, from my personal observations, appears to be far more persistent than cockroaches or other domestic insects. Solutions containing D.D.T., used on walls, apparently do not prevent reinfestation by house flies.

"Gammexane"

"Gammexane" insecticides are manufactured by Imperial Chemical Industries Limited. They are based on the gamma isomer of benzene hexachloride and are available for use in the form of dusts, sprays and smoke generators.

In catering establishments the spray form, Gammexane LO44, is most popular. This consists of Gammexane Liquid Concentrate LG240 diluted by seventy-four parts of kerosene. It will generally be found more satisfactory to obtain the Gammexane already made up in the form LO44, but large groups of establishments may find it rather cheaper to buy the concentrate and to have it diluted. The spray is applied by a piston sprayer, which may be purchased for about five shillings from any ironmonger. The spray should be applied liberally to walls and ceilings, particular attention being paid to any places where flies or cockroaches have been seen. The spray does not have a rapid knock-down effect, but it has a most persistent action. Therefore frequent treatments are by no means so essential as with certain other types of spray.

In badly infested premises smoke generators, if properly used, can be very effective. Gammexane smoke generators (Number 22) are suitable for use in

kitchens and stores. All doors and windows should be closed before a match is applied to the side of the generator. There is no resulting flame but the gas will continue to discharge until, in about a minute, the carton is empty. A dense white smoke will result, leaving a deposit on all exposed surfaces which is absolutely fatal to insects. One Number 22 generator is required for every thousand cubic feet capacity.

Cranford-Beason has suggested that Gammexane has no effect against ovæ, larvæ, or pupæ, but is very satisfactory against adult flies. It has proved particularly valuable against crab lice.

Insecticides of vegetable origin, such as Pyrethrum have long been popular for killing insects. Pyrethrum is manufactured from the dried flowers of the pyrethrum plant *Chrysanthemum Cinerariæfolium.* The powder, however, is not particularly effective as an insecticide, as although it may paralyse the insects for as long as twenty-four hours, unfortunately most of them eventually recover. Some mites and insects are highly resistant to pyrethrum in any form. It cannot, therefore, be considered a satisfactory method of destroying insects. The large group of powders containing arsenic are quite unsuitable for killing cockroaches in kitchens, as the risk is far too great.

In a single shipment of 145 tons of wheat from America to England during 1868, weevils to a total weight of one and three quarter tons were removed by screening. The old sailing ships carrying grain were often literally heaving with weevils, but fortunately, these troubles are now largely matters of history. Very little weevil infested grain or flour now reaches the consumer.

CHAPTER XVIII

THE LAW RELATING TO THE SALE OF FOOD

The first important stage in modern food legislation was the passing of the Public Health Act, 1875, and the Food and Drugs Act of the same year. The Public Health Act gave power to Local Authorities to seize food which was unfit for human consumption, and to have it destroyed. The Food and Drugs Act, 1875, was mainly a preventive measure against fraudulent and dangerous adulteration of food which had become widespread with the progress of chemical knowledge. Many unscrupulous people found more and more ways to adulterate food. The evils had been pointed out by Accum in the early years of the century, but it was not until the passing of this Act that remedial measures became enforceable by law.

It was almost another sixty years, however, before a major consolidating Act was passed dealing in a comprehensive manner with all the legislation on food handling and food adulteration. This was the Food and Drugs Act, 1938.

Under the powers of the Transfer of Functions (Food and Drugs) Order, 1948, the Minister of Food became responsible as from March 1st, 1948, for the operation of the Food and Drugs Act of 1938 and 1944. The matters now dealt with by the Minister of Food include food inspection, the composition and description of food and statutory instructions relating to hygienic methods of food handling.

Food poisoning and ice-cream were specially excluded from the Transfer of Functions Order, 1948, and these matters remain the responsibility of the Minister of Health.

It is forbidden, under Section 1, for any person to add any substance to food which would make it injurious to health. Section 2 renders it an offence to abstract any substance "so as to affect" injuriously the foodstuff. One of the most important provisions of the Act is contained in Section 3, which prohibits the sale of any food not of the nature, substance or quality demanded. Offences in regard to the sale of unsound food are described in considerable detail in Section 9. Although Section 25 prohibits the sale of tuberculous milk, it is surprising to find that no specific obligations are made in regard to tuberculous meat.

Offences in regard to the sale of tuberculous meat appear to be under Section 3 or Section 9. There can be little doubt that the present standards of meat inspection leave a great deal to be desired. Under Section 93 action may be taken against offenders by the Ministry of Agriculture and Fisheries, but I have never heard of this section being put into operation. In practice in regard to diseased meat, it would probably be better to bring an action under the Common Law rather than the Food and Drugs Act.

Precautions against the contamination of food are listed in Section 13. The walls, ceiling, floor, windows and doors of any room used for food preparation or storage must be kept in a proper state of repair and must be kept clean. The room must not be used as a sleeping place. Washing facilities for employed persons must be provided within a reasonable distance.

A baker in Kendal was fined £60 during November, 1950, for breaches of the Food and Drugs Act. The main points raised by the prosecution were walls, floors and windows in a bad state of repair, while filth also had been allowed to accumulate.

Rooms used in the preparation and storage of food must be clean and free from offensive odours. It has been suggested that a Section ought to include a definite provision for adequate lighting.

Section 77 of the Act gives authority to properly appointed officers of local authorities of entry to premises, at any reasonable time, for the purpose of ascertaining whether there has been any failure to comply with the Act.

The Act applies mainly to England and Wales. The wholesomeness of food in Scotland is controlled by the powers applied by the Public Health (Scotland) Act, 1897. It has been suggested by many eminent authorities that it would be better for everyone concerned if the Scots law on food was brought into line with the English law.

The regulations regarding the sale of horseflesh are very severe. Under Section 38 of the Food and Drugs Act, 1938, no person may sell or offer for sale any horseflesh for human consumption except in a shop or stall over which is a notice in legible letters stating that horseflesh is sold there. The notice must be displayed in a conspicuous position, so that it may be visible whenever horseflesh is being sold. Horseflesh may only be sold to a person who actually demands it.

Under the powers of the Horseflesh (Control and Maximum Prices) Order, 1941, S.R.O. No. 1862 of 1941, horseflesh for human consumption may only be

sold by a shop which does not sell any other type of meat. Under Section 6 of the Order no person may manufacture, for human consumption, any meat paste, soup, meat roll, galantine, sausage, meat pie or compound article of food containing horseflesh.

There should be little difficulty in distinguishing raw horseflesh from other meat. The most striking characteristic is the rather sickly smell, and it is inclined to be rather greasy to the touch. There is no marbling of fat in the muscular tissue as with beef. The general appearance is much coarser and darker than beef.

Formerly there was little control of the manufacture and sale of ice-cream. Under the powers of the Ice Cream (Heat Treatment Regulations), 1946, the mixture shall be subjected to a temperature of not less than 150° F. for thirty minutes or alternatively of not less than 160° F. for ten minutes. After the heat treatment it must be frozen. Once that has taken place, it must be kept continuously at a temperature not exceeding 28° F. If that temperature is exceeded at any time before sale, heat treatment must again be carried out. In practice this means that if an ice-cream refrigerator breaks down, the contents must be removed and not offered for sale.

Considerable attention has been given by Parliament to preservatives in foodstuffs. The Public Health (Preservatives in Food) Regulations, S.R.O. No. 775 of 1925 as amended by S.R.O. No. 1557 of 1926, No. 577 of 1927 and No. 633 of 1940, totally forbid the inclusion of any preservative in milk, cream, butter, margarine, cheese, bacon, ham, brawn, fish, potted fish, egg products, lemon curd, mincemeat and cake.

Outside London, food poisoning was not a notifiable

disease until October, 1939. Prior to the recent war, consequently, records were incomplete and a great deal of newspaper scares have been due to lack of previous figures with which current figures might be compared.

Under the powers of Section 17 of the Food and Drugs Act, 1938, there is now an obligation on every registered medical practitioner to report every case of food poisoning to the Medical Officer of Health for the district.

Canned goods, generally, must be regarded as among the safest of foods. During the harvesting seasons they are generally more expensive than fresh fruit and vegetables. At other times, however, they are cheaper than produce grown under hot house conditions. Increasing attention is being paid by catering establishments to dehydrated vegetables, as they are more economical in storage space than canned goods. The quick frozen trade in fruit and vegetables is still in its infancy in this country. Prices of quick frozen foods are not yet competitive with canned foods.

The enormous quantities of food which have been commercially canned in recent years prove without a doubt their general safety. Canned food must be considered far more wholesome than many qualities of fresh produce. Canned meat is greatly to be preferred, for instance, to the general standard of "manufacturing" fresh meat which has been issued in recent years.

Storekeepers should be instructed in the principles of examination for canned food. A can with concave ends, reasonably free from rust and giving no appearance of a leak, is a satisfactory can. Any can showing

signs of external rust should be carefully opened and examined before use. A " blown " can is generally caused by bacterial action. Acid fruits, however, may produce a similar result, but it is wiser to be most conservative in regard to the total destruction of all canned food showing any sign of spoilage.

A satisfactory standard of canned meat depends to a considerable extent on the quality of the raw meat. The handling of the meat before and during canning must be of the highest standards, otherwise a high percentage of spoiled cans must be expected. Under the powers of Statutory Instrument No. 1509 of 1948, meat paste must contain a minimum meat content of 55 per cent. of meat.

Fruit of a satisfactory standard for canning must be firm, ripe and fully coloured. Under-ripe fruit will shrivel and toughen during canning. Over-ripe fruit will break down, and on the can being opened will look a very unpleasant mess. Over-ripe fruit, too, may be heavily infected with micro-organisms which may cause a large number of " blown " cans. Some canneries are now handling enormous quantities of food. In a Sacramento cannery in the United States (Libby McNeill and Libby) some 17,000 cases of peaches have been canned during a single day. Some fruits, such as cherries and strawberries, are inclined to discolour badly during the canning processes. The modern practice is to blanch these fruits and to add artificial colouring to the pack. Lacquer is generally applied to the inside of cans used for canning fruit, to prevent minute particles of metal dissolving in the fruit and so destroying the colour of the fruit. Lacquer is also applied by most packers to cans intended for meat.

Condensed milk is one of the longest keeping canned foods as, particularly with the sweetened varieties, the high percentage of sugar prevents spoilage from bacteria.

The Ministry of Food has recommended that canned fish should be sold under the following names:

Clupea Harengus	Herring.
Young Clupea Harengus	Sild.
Sardina Pilchardus	Pilchard.
Young Sardina Pilchardus	Sardine.
Clupea Sprattus	Sprat.
Young Clupea Sprattus	Brisling.
Stolephorus Encrasicholus	Anchovy.

It does not appear, however, that the Ministry of Food could take legal action against any manufacturer disregarding the recommendations.

The Ministry of Food has issued a Statutory Instrument (No. 1509 of 1948) that a fish paste must contain at least 70 per cent. of fish.

The Ministry is apparently not prepared to take legal action against any paste manufacturer when the named fish paste has a minimum content of :

Anchovy . . .	15 per cent. anchovies.
Crab	10 per cent. crab.
Lobster . . .	10 per cent. lobster.
Prawn	12½ per cent. prawn.
Salmon . . .	25 per cent. salmon.
Sardine . . .	25 per cent. sardine.

With such low standards, it is hardly surprising that considerable confidence has been lost by the public in paste of English manufacture, particularly as many

foreign brands conform to considerably higher standards.

The Ministry of Food has recommended that meat soups canned in the United Kingdom should contain at least 6 per cent. by weight of meat. The market in canned soups has totally collapsed because of the generally poor quality of canned soup. It is unlikely to recover while the Ministry recommends as satisfactory such a low standard.

Legal standards have also been laid down in regard to canned vegetables. Canned peas must contain at least 2·3 per cent. of sugar and between 1·25 per cent. and 2·5 per cent. by weight of salt.

All canned vegetables must contain between 1·25 per cent. and 2·5 per cent. of salt under the powers of S.R.O. Nos. 1724 of 1946, S.I. 397 of 1948 and 1884 of 1948.

All canned fruit, except in gallon cans, must be packed in a syrup of not less than 39° Brix. Fruit in gallon cans may be packed in water, but a label must be fixed to the can reading " Water Pack." Fruit, in gallon cans, may also be packed in light syrup provided a label is affixed stating the fact.

Cherries, except in gallon cans, must be packed in a syrup of not less than 32° Brix. All these regulations are incorporated in S.R.O. Nos. 1724 of 1946, S.I. 397 of 1948, and 1884 of 1948.

Under the powers of S.R.O. No. 842 of 1944 and No. 1221 of 1946 legal minimum standards have been laid down for jam. These are as follows :

Apricot.	.	40 per cent. of the named fruit by weight.
Cherry .	.	40 per cent. of the named fruit by weight.
Gooseberry	.	30 per cent. of the named fruit by weight.

Rhubarb	40 per cent. of the named fruit by weight.
Strawberry	30 per cent. of the named fruit by weight.

Standards are also laid down for mixed jams. These are:

Apple and plum	40 per cent. (30 per cent. apple and 10 per cent. plum).
Apricot and peach	40 per cent. (20 per cent. apricot and 20 per cent. peach).
Plum and blackcurrant	40 per cent. (30 per cent. plum and 10 per cent. blackcurrant).
Strawberry and gooseberry	30 per cent. (15 per cent. strawberry and 15 per cent. gooseberry).

Unfortunately, these qualities are very low compared with standards in the British Dominions. South African and Australian jams have a very high fruit content, so that it is only to be expected that they have made a considerable impression on the United Kingdom market. The future prospects for home produced jams must be considered very difficult unless the present standards are substantially improved. The only permitted preservatives, in addition to sugar, is sulphur dioxide and then only to a maximum of forty parts per million. This means in effect that sulphur dioxide can only be used in the best equipped and controlled jam factories. Generally, it would appear in practice that the use of sulphur dioxide as a preservative in jam has practically disappeared. The position in regard to glucose as an ingredient of jam is rather complex. Some local courts have considered it an adulterant, while others have found it to be a perfectly legal ingredient.

The danger to health from duck eggs has been

recognized in Germany for many years. Every German container of duck eggs is marked:

"Duck Eggs. To be boiled for at least 8 minutes or thoroughly baked."

In this country, however, the Ministry of Health does not appear to have issued any general warning. This can only be regarded as most surprising in view of the number of fatal cases of food poisoning which have been caused, in recent years, by eating infected duck eggs. The *Salmonella typimurium* or *Bacillus enteritidis* have been identified in every case. It is strongly recommended that duck eggs should not be used, in any circumstances, in catering establishments.

Vinegar, when out of condition, becomes cloudy with the appearance of "mothers." It will be unpleasant and bitter to taste. Vinegar becomes cloudy as a result of bacterial action and because of inefficient pasteurization. "Mothers," in vinegar, are actually masses of living bacteria and therefore should never be used as food. All bottled vinegar is pasteurized to prevent these developments.

Darkening of tomato ketchup is a fault usually due to inefficient pasteurization and may denote bacterial activity.

The brine in all pickles should contain at least 15 per cent. of salt, otherwise bacterial spoilage will occur. Pickles should never be manufactured in iron vessels but always in stainless steel ones. Iron vessels will produce brown or black stains (iron tawnates) on the vegetables. Piccalilli and similar pickles will not keep unless the final acetic acid content of the liquid is in excess of 3·5 per cent.

The Mineral Oil in Food Order, 1949, has in effect totally prohibited the use of mineral oil in the composition of any prepared foodstuffs. Prior to the laying of the Order before Parliament, some bakers were using mineral oil for making pastry, but the practice has now been totally prohibited by law.

Guildford Hygienic Traders Guild

In this country there is no doubt that Guildford has led the country with its clean food campaigns. After the war it was found that certain food premises were unsatisfactory and a comprehensive survey was made during November, 1946.

The survey found that:

(*a*) In many cases premises were faulty.
(*b*) Inadequate washing facilities.
(*c*) Inadequate sanitary accommodation.

As a result of conferences with food traders and a clean food exhibition, it was decided to set up the "Guildford Hygienic Traders Guild." The objects of the Guild are:

(*a*) Improving the sanitary conditions and arrangements in food handling premises.
(*b*) Ensuring that the statutory standards of food hygiene were observed.
(*c*) Establishing codes of practice.

Undoubtedly the Guild, which became operative on November 3rd, 1947, has been a great success and has shown what may be achieved by voluntary agreement in regard to food hygiene in this country.

A similar attempt to raise the standard of cleanliness has been made by the Holborn Borough Council who issue a special badge with their Coat of Arms to all

hotels and restaurants in their area whose hygienic standard has been approved.

Catering licences are issued by the Ministry of Food as a part of the scheme for the control of foodstuffs used in establishments. It would appear that in practice the Ministry of Food advises the Local Health Authority when a new licence is granted. Any improvements which may be necessary to the premises, however, appear to be carried out on a more or less voluntary basis.

CHAPTER XIX

FOOD LEGISLATION OVERSEAS

In view of the enormous quantities of *imported* food consumed in this country, it may be of interest to give some details regarding food legislation in the exporting countries. In most cases the obligations are far more severe on the exporter than the regulations regarding the landing of foodstuffs in the United Kingdom, under the Imported Food Regulations. In a work of this type it is not possible to give a completely comprehensive survey but an attempt has been made to give a fairly wide selection of regulations which are in force overseas.

Canada

Every food factory in Canada must be registered with the Dominion Department of Agriculture under the powers of the Meat and Canned Foods Act, 1907, and the regulations made under it.

The following colours may be used in the canning and preserving of food:

(*a*) Natural colours—Cochineal and innocuous vegetable colour extractives.

(*b*) Artificial colours—Caramel and carbon.

(*c*) Coal tar dyes—

Red shades—	Amaranth.
	Ponceau 3R.
	Erythroseine.
	Ponceau SX.
	Oil red XO.
Orange shades—	Orange 1.
	Orange S.S.

Yellow shades—	Naphthol yellow S.
	Tartrazine.
	Sunset yellow F.C.F.
	Yellow A.B.
	Yellow O.B.
Green shades—	Light green S.F. Yellows.
Blue shades—	Brilliant blue F.C.F.
	Indigotine.

The coal tar dyes referred to above must be prepared in an especially pure form intended for food manufacture.

The permitted preservatives are:

Benzoic acid Salts of benzoic acid	1,000 parts per million.
Sulphurous acid Salts of sulphurous acid	500 parts per million.

Minimum sugar syrup content in canned or frozen fruits is as follows:

Fruit	Brix Measurement
Loganberries	50 per cent.
Apricots Cherries Peaches Rhubarb Strawberries	45 per cent.
Blackberries Currants Gooseberries Raspberries	40 per cent.
Pears	35 per cent.
Apples Grapefruit Plums	30 per cent.

The sizes of cans for use as food containers when packed in Canada are standardized as follows:

	Canada Size	Diameter and Height
Fruits	10 fluid oz.	211 × 400
	15 fluid oz.	301 × 406
	20 fluid oz.	307 × 409
	28 fluid oz.	401 × 411
	105 fluid oz.	603 × 700
Fruits Solid Pack	15 fluid oz.	301 × 406
	20 fluid oz.	307 × 409
	28 fluid oz.	401 × 411
	105 fluid oz.	603 × 700
Vegetables	10 fluid oz.	211 × 400
	15 fluid oz.	301 × 406
	20 fluid oz.	307 × 409
	28 fluid oz.	401 × 411
	105 fluid oz.	603 × 700
Tomato Purée	28 fluid oz.	401 × 411
	105 fluid oz.	603 × 700
	126 fluid oz.	603 × 812

The net and drained weight of the can contents are also controlled as follows:

	No. 2 (20 oz.) 307 × 409		No. 2½ (28 oz.) 401 × 411		No. 10 (105 oz.) 603 × 700	
	Net oz.	*Drained* oz.	*Net* oz.	*Drained* oz.	*Net* oz.	*Drained* oz.
Apples Solid Pack	—	—	26	—	90	64
Apricots in Syrup	21	11				
Gooseberries	21	11				
Loganberries	21	11				
Raspberries	21	10				
Strawberries	21	8				
Cherries	21	12				
Pears in Syrup	21	12				
Peaches in Syrup	21	12				
Pineapple Sliced	21	14				
Plums	20	11				
Asparagus	20	12				
Carrots Diced	20	13				
Peas	20	13				
Spinach	19	13				

The minimum net and drained weights of containers for frozen foods are also officially controlled.

Frozen Product	16 Fluid oz. size Net Weight
Apples	15 oz.
Blackberries	15 oz.
Loganberries	15 oz.
Raspberries	15 oz.
Strawberries	15 oz.
Plums	15 oz.
Asparagus	10 oz.
Cauliflower	10 oz.
Peas	12 oz.

Standards for quality are also officially controlled for canned fruits and vegetables.

There are three qualities: Fancy, Choice and Standard. Generally, fruits must be 90 per cent. whole to grade Fancy, 80 per cent. whole to grade Choice and 60 per cent. whole to grade Standard. The variation in colour and for size is also defined within narrow limits for the two higher grades.

The species of Canadian salmon, packed in the can, is identified by the following code letter stamped on the tin:

Sockeye	S.
Pinks	P.
Cohoes	C.
Chums	K.
Spring	T.
Bluebacks	B.
Steelhead Trout	T.

The regulations in regard to the operation of canneries in Canada are contained in P.C.5701, Regulations Governing the Inspection of Canned Fish and Shellfish and the Operation of Canneries, 1949.

Every package of butter for export, under the Dairy Industry Regulations, must be marked with the churning number, the registered number, the date, the words " 56 lb. net " and " Canadian Butter," with the name of the province in which it was manufactured. In the Dairy Regulations it may be of interest to note that the specification for the butter boxes alone runs to two and a half pages of text. Such is the care in which butter is manufactured in Canada for export.

There is similar control in regard to Canadian cheese, as for export the boxes must be marked with the registered number, the vat number, the date of manufacture and the word " Canada." All cheese intended for export must be graded. The grades are:

First Grade
Second Grade
Third Grade
and Below Third Grade.

The scale of points for Cheddar cheese is as follows:

Flavour . . .	45 points
Texture . . .	25 points
Closeness . . .	15 points
Colour . . .	10 points
Finish .	5 points
	100 points

First Grade cheese must score 92 points.
Second Grade cheese must score 87 points.
Third Grade cheese must score 87 points.

The difference between second and third grade cheese is based on the flavour. If the cheese scores more than 37 points for flavour it is graded Second. If it scores less than 37 points it is graded Third. Any cheeses which have not scored a total of 87 points are graded " Below Third."

The grading for butter is based on a similar system.

Australia (New South Wales)

Under the Regulations made under the powers of the New South Wales Pure Food Act, 1908, any article of food which has been artificially coloured or flavoured must be so marked (Section 3). The following foods, however, are exempted from this provision:

Cheese
Confectionery
Ice-Cream
Fruit Jelly Crystals.

Under Section 8 it is forbidden to use any insecticide containing arsenic, strychnine or other poison " so as to expose any food for sale to risk of contamination therewith."

It is forbidden, under Section 9, to use saccharin to sweeten any foodstuff.

Section 47 establishes a standard for jam. The jam must contain at least 45 per cent. by weight of the named fruit. The remaining 55 per cent. must be sugar with a maximum of 15 per cent. of glucose. It is obvious that this is a much higher standard than anything

which has yet been attempted in the United Kingdom.

It is, however, rather surprising to find, under Section 76, a long list of permitted colouring matters which may be added to foodstuffs. This list is considerably longer than for any other English-speaking country.

Under Section 77, Sub-section 4, it will be noticed that it is illegal to put silver coins in a Christmas pudding. Under sub-paragraph 14, the use of chipped crockery is totally prohibited. The blowing open of paper bags by assistants in food shops is an offence against sub-paragraph 26. While under the same sub-paragraph the shopkeeper is responsible for ensuring that his customers do not handle food.

Section 78 compels every butcher to have a glass front to his shop and, incidentally, apparently forbids the sale of meat from an open stall in a street or market.

Section 92 forbids the sale of any enamel ware, for the storage or preparation of food, which contains antimony, lead and/or arsenic.

The penalty for any breach of the regulations is £20.

In the city of Sydney any food factory must be registered with the City Council.

Union of South Africa

The export of canned fruit, canned vegetables and jam from the Union of South Africa is controlled by the Order No. 256 of 1944.

The size of cans is expressed as usual in the canning industry. The first digit is the number of inches and the second two digits are sixteenths of an inch. Thus the first item is $2\frac{11}{16} \times 3\frac{3}{16}$.

Canned Fruit

Description	Nominal Capacity	Size
Picnic	8 oz.	211 × 303
A.1	11 oz.	211 × 400
1 lb. tall	16 oz.	301 × 411
1 lb. flat	16 oz.	308 × 308
A.2	20 oz.	307 × 408
A.2½	30 oz.	401 × 411
A.10	110 oz.	603 × 703

Canned Jam

1 lb.	16 oz.	301 × 309
2 lb.	32 oz.	401 × 402
7 lb.	7 lb.	603 × 514
8 lb.	8 lb.	603 × 700
4 gal. square	50 lb.	904 × 904 × 1310

Canned Pulp

A.10	110 oz.	603 × 700
4 gal. square	50 lb.	904 × 904 × 1310

Canned Vegetables

A.1	11 oz.	211 × 400
1 lb. tall	16 oz.	301 × 411
A.2	20 oz.	307 × 408
A.2½	30 oz.	401 × 411
A.10	110 oz.	603 × 700

The maximum content of fruits in the can is controlled, so that good sized fruits only are used in apricot and peach packs. The type of fruit, too, is strictly controlled for canning, e.g. only certain types of pears may be packed for choice quality.

The legal obligations of jam manufacturers in South Africa are not nearly so severe as those in force in Australia.

United States of America

In the United States inter-state commerce in adulterated food is prohibited under the Food, Drug and Cosmetic Act of 1938, as follows:

Section 402 (*a*) 3. "If it consists in whole or in part of any filthy, putrid or decomposed substance, or if it is otherwise unfit for food"; and

Section 402 (*a*) 4. "If it has been prepared, packed or held under insanitary conditions, whereby it may have become contaminated with filth, or whereby it may have been rendered injurious to health."

The "may have" clause in the above section should be given particular attention because it is the most powerful on food hygiene in the English-speaking world.

The Food, Drug and Cosmetic Act has laid such a severe obligation on all food processors that if any deleterious substance is added to the food then all that food is adulterated.

The United States Supreme Court has ruled that "an officer of a corporation is subject to prosecution under the Food, Drug and Cosmetic Act for the acts of the corporation in shipping misbranded or adulterated goods though he may not have been conscious of the fraud." It has also been held that conscious fraud is not essential for a conviction under the Food, Drug and Cosmetic Act.

Inspection of Food in France

The inspection of food in France does not appear to have been put on a proper footing until as recently as January, 1941, when the Bureau of Sanitary Inspection of Foodstuffs was established.

Mr. Paul Martin, Canadian Minister of Health and Welfare, recently made a plea for standardization of food legislation in the English countries. He pointed out that the present differences were setting up artificial barriers between the nations and were a deterrent to trade.

CHAPTER XX

THE HYGIENE OF CATERING ESTABLISHMENTS IN THE UNITED STATES, CANADA, NEW ZEALAND, AUSTRALIA, NORWAY AND SWEDEN

THE sanitary control of eating establishments, including industrial canteens, is vested in the individual states, but the control is exercised in the larger municipalities by the City Councils. Measures to prevent food poisoning and the prevention of communicable disease through food are under the control of the Federal Security Agency Public Health Services, whose headquarters are in Washington. The U.S. Public Health Service, however, has in law no legal jurisdiction in the local enforcement of sanitary regulations, as the Service acts only in an advisory capacity to State and Local Health departments.

The Public Health Service has issued a model eating establishment code. This code, Public Health Bulletin Number 280 of 1943, has been widely adopted by individual States and City Councils. It is greatly superior to any suggested byelaws in the U.K.

Section 1 ordains the inspection and grading of all eating establishments.

Section 2 orders that only eating establishments graded " A " or " B " may be operated.

Part II deals with the Sanitary regulations for eating establishments.

Section 4 deals with the taking of samples of food by properly authorized officials.

Section 5 orders that at least once every six months every eating establishment must be inspected by an official of the Health Department. Degrading of an eating establishment is automatic if violation of the code is discovered on two successive visits.

Section 6 lays down the obligations of a Grade " A " restaurant and, as it is of considerable interest, I am quoting it in full:

" Item 1. Floors.—The floors of all rooms in which food or drink is stored, prepared or served, or in which utensils are washed, shall be kept clean and in good repair.

" Item 2. Walls and Ceilings.—Walls and ceilings of all rooms shall be kept clean and in good repair. All walls and ceilings of rooms in which food and drink is stored or prepared shall be finished in light color. The walls of all rooms in which food or drink is prepared or utensils are washed shall have a smooth, washable surface up to the level reached by splash or spray.

" Item 3. Doors and Windows.—When flies are prevalent, all openings into the outer air shall be effectively screened and doors shall be self-closing, unless other effectttive means are provided to prevent the entrance of flies.

" Item 4. Lighting.—All rooms in which food or drink is stored or prepared or in which utensils are washed shall be well lighted.

" Item 5. Ventilation.—All rooms in which food or drink is stored, prepared or served, or in which utensils are washed shall be well ventilated.

" Item 6. Toilet Facilities.—Every restaurant shall be provided with adequate and conveniently located toilet facilities for its employees conforming with the ordinances of the city. In restaurants, hereafter constructed, toilet rooms shall not open directly into any room in which food, drink or utensils are handled or stored. The doors of all toilet rooms shall be self-closing. Toilet rooms shall be kept in a clean condition, in good repair and well lighted and ventilated. Hand-washing signs shall be posted in

each toilet room used by employees. In case privies or earth closets are permitted and used, they shall be separate from the restaurant building, and shall be of a sanitary type constructed and operated in conformity with the standards of the State Board of Health.

"Item 7. Water Supply.—Running water under pressure shall be easily accessible to all rooms in which food is prepared or utensils are washed, and the water supply shall be adequate, and of a safe sanitary quality.

"Item 8. Lavatory Facilities.—Adequate and convenient hand-washing facilities shall be provided, including hot and cold running water, soap and approved sanitary towels. The use of a common towel is prohibited. No employee shall resume work after using the toilet room without first washing his hands.

"Item 9. Construction of Utensils and Equipment.—All multi-use utensils, and show and display cases or windows, counters, shelves, tables, refrigerating equipment, sinks and other equipment or utensils used in connection with the operation of a restaurant shall be so constructed as to be easily cleaned and shall be kept in good repair. Utensils containing or plated with cadmium or lead shall not be used; provided that solder containing lead may be used for jointing.

"Item 10. Cleaning and Bacterial Treatment of Utensils and Equipment.—All equipment, including display cases or windows, counters, shelves, tables, refrigerators, stoves, hoods and sinks shall be kept clean and free from dust, dirt, insects and other contaminating material. All cloths used by waiters, chefs and other employees shall be clean. Single service counters shall be used only once.

"All multi-use eating and drinking utensils shall be thoroughly cleaned and effectively subjected to an approved bactericidal process after each usage. All multi-use utensils used in the preparation or serving of food and drink shall be thoroughly cleaned and effectively subjected to an approved bactericidal process immediately following the day's operation. Drying cloths, if used, shall be clean and shall be used for no other purpose.

"No article, polish or other substance containing any cyanide preparation or other poisonous material shall be used for the cleaning or polishing of utensils.

"Item 11. Storage and Handling of Utensils or Equipment.—After bactericidal treatment, utensils shall be stored in a clean, dry place protected from flies, dust and other contamination, and shall be handled in such a manner as to prevent contamination as far as practicable. Single service utensils shall be purchased only in sanitary containers, shall be stored therein in a clean dry place until used, and shall be handled in a sanitary manner.

"Item 12. Disposal of Wastes.—All wastes shall be properly disposed of and all garbage and trash shall be kept in suitable receptacles, in such manner as not to become a nuisance.

"Item 13. Refrigeration.—All readily perishable food and drink shall be kept at or below 50° F. except when being prepared or served. Waste from refrigeration equipment shall be properly disposed of.

"Item 14. Wholesomeness of Food and Drink.—All food and drink shall be clean, wholesome, free from spoilage, and so prepared as to be safe for human consumption. All milk, fluids, milk products, ice-cream and other frozen desserts served shall be from approved sources. Milk and fluid milk products shall be served in the individual original containers in which they were received from the distributor or from a bulk container. Provided that this requirement shall not apply to cream, which may be served from the original bottle or from a dispenser approved for such service. All oysters, clams and mussels shall be from approved sources, and if shucked shall be kept until used in the containers in which they were placed at the shucking plant.

"Item 15. Storage, Display and Serving of Food and Drink.—All food and drink shall be so stored, displayed and served as to be protected from dust, flies, vermin, depredation and pollution by rodents, unnecessary handling, droplet infection, overhead leakage and other contamination. No animals or fowls shall be kept or allowed in any room in which food or drink is prepared or stored.

All means necessary for the elimination of flies, roaches and rodents shall be used.

"Item 16. Cleanliness of Employees.—All employees shall wear clean outer garments and shall keep their hands clean at all times while engaged in handling food, drink, utensils or equipment. Employees shall not expectorate or use tobacco in any form in rooms in which drink or food is prepared.

"Item 17. Miscellaneous.—The premises of all restaurants shall be kept clean and free of litter or rubbish. None of the operations connected with a restaurant shall be conducted in any room used as living quarters. Adequate lockers or dressing rooms shall be provided for employees' clothing and shall be kept clean. Soiled linens, coats and aprons shall be kept in containers provided for this purpose."

Eating establishments are graded "B" if they fail to satisfy the requirements of Items 1, 2, 4, 5 or 17. Eating establishments are graded "C" if they are unsatisfactory but not sufficiently so to justify a closing order.

Part III of the Code is a legal interpretation of the Ordinance Number 280. It is not the intention that grading permits should be issued annually. Once a permit is issued it remains operative until it is rescinded or degraded. A card showing the grading of the establishment must be displayed prominently, so that it may be seen by the public. It may also be used on menu cards if it is considered desirable by the management. The Public Health Service recommends that in practice every eating establishment should be visited once every three months.

Canada

In Canada, food factories and food handling establishments come largely under the control of the Pro-

vincial Governments. There are no Federal regulations relating to the sanitation of eating establishments. In Ontario the regulations under the Public Health Act were made on October 4th, 1947. The usual obligations are incorporated but in addition paragraph 7 states:

" Suitable racks or shelves shall be provided for the storage of food and no shelves or racks shall be placed less than ten inches from the floor."

Paragraph 9 is also of considerable interest:

" No cups, glasses or dishes which are chipped or cracked shall be used in the preparation, service or storage of food."

In Alberta, paragraph 262 of the Food and Drink Regulations says:

" Any vehicle having previously been used for transporting cattle, horses, hogs, sheep or poultry, or any offensive or putrifiable material of any kind whatsoever, shall not be used for the transportation of foodstuffs for human consumption until such vehicle has been thoroughly cleaned, lime-washed and placed in a sanitary condition."

This means in effect that no vehicle used for the carriage of unpacked food can be employed for any other purpose.

In the Canadian Province of Saskatchewan no public eating establishment may be operated without first obtaining a licence (Saskatchewan Regulations governing Public Eating Establishments, paragraph 3). In addition, public eating establishments are graded, according to hygiene, under categories " A," " B," " C "—paragraph 5. In all establishments dry sweeping is prohibited—paragraph 12. Paragraph 24 relating to rubbish and swill says:

"Approved garbage containers shall be provided and when filled shall be removed from any room in which food is prepared, stored or served. Pending removal from the premises, containers shall be stored in a separate room, compartment or place approved by the Minister, Medical Health Officer or Sanitary Officer."

In British Columbia no cup or glass may be provided for common use. Section 8 of the British Columbia Regulations governing the sanitation of Eating and Drinking Places states:

"No proprietor or employee of an eating or drinking place shall provide or expose for common use, or permit to be so provided or exposed, or allow for common use, any cup, glass or other receptacle used for drinking purposes."

Under Section 11 obligations regarding illumination are laid down so that it shall be equivalent to at least ten foot candles at a distance of thirty inches from the floor.

Under Section 12 the window area of all rooms shall be equivalent to at least one-tenth of the floor area.

Section 29 goes considerably further in regard to swill disposal than other Canadian provinces. It states:

"Filled garbage containers shall not be allowed to remain in any room where food or drink is prepared or served."

The inspection of eating establishments throughout Canada is particularly severe compared with conditions in Europe.

Bye-laws concerning Food Establishments and Restaurants in the City of Montreal

All eating establishments in Montreal are licensed by the City Council (Bye-laws No. 926, Article 2) and must be renewed annually.

Every kitchen must be constructed so that there is a minimum of 1,000 cu. ft. of air per employee. Under the powers of Article 25, garbage or other refuse must not be allowed to accumulate in, under or around the building and in any case must be removed at least once daily. The use of cracked or chipped glasses and crockery is totally prohibited. All sinks must be of metal, as wooden sinks are contrary to the Bye-laws. Dry sweeping is forbidden under Article 69. The practice of re-hashing plate scrapings into saleable dishes is forbidden by Article 61. The practice of wrapping fish and chips or other foodstuffs in newspaper is forbidden by Bye-law No. 569, Article 1. All eating establishments come under the direct supervision of the Health Inspectors. If Regulations are not complied with the City Council brings an action against the offenders in the Municipal Court.

New Zealand

The Health (Eating House) Regulations, 1946, give the authorities considerable power in controlling standards of hygiene in New Zealand. Under Section 7 all eating houses must be licensed by the local authority. Section 15 orders that every kitchen must be at least 8 ft. in height. A notice must be posted, under Section 22, in every staff lavatory ordering the staff to wash their hands after using the privy.

Milk, under Section 28, may not be allowed to

remain on the premises more than six hours unless placed in a refrigerator. Under Section 31 it is illegal to use any cracked utensil. Tea towels must be boiled under Section 31, at least five minutes daily. The penalty for an offence against these regulations is £20.

Australia

The City of Sydney has special powers under the Sydney Corporation Acts, 1932–4. Under these powers Bye-law No. 36 relating to eating houses has been put into operation.

Section 4 orders that all eating establishments must be licensed by the City Council. The licence of an establishment may be cancelled after two convictions for offences under the Bye-laws (Section 5). If the premises do not comply with the requirements of the City Council in regard to construction, sanitation, cleanliness, ventilation and lighting, the licence need not be granted or may be cancelled if already issued. Under Section 6 a new licence must be applied for on each occasion that there is a change of ownership.

The City of Cape Town

All catering establishments in Cape Town must be licensed by the City Council. The Council has the right to refuse or revoke a licence. As the Ordinance was framed as long ago as 1912, however, it is hardly surprising that it does not contain matters which have been more adequately and more recently dealt with elsewhere.

Norway

The Public Legislation in Norway is contained in the Law of May 16th, 1860, as amended by the Law of

April 29th, 1939. Under the power of these laws, regulations have been formulated for the control of Public Eating Establishments (May 2nd, 1950). The principal provisions include a cautionary notice to employees which must be prominently displayed in kitchens.

The Department also has the right of entry and the inspection of equipment and utensils. All cutlery and plates must be soaked in cold or lukewarm water before being placed in the dish-washing machines. Washing machines must be approved by the Public Health Department. All cutlery and crockery must remain in the machine for at least one minute followed by a rinse. The officially approved machines must be installed by the States Institute, who are entitled to charge an installation fee of 150 kroner.

The Health Department has power of closure. An underground room must not be used either as a kitchen or as a service room. The window area must be at least one-tenth as large as the floor area. Spitting by customers or employees is prohibited, except in spittoons officially approved by the Health Department. Each employee must have his own towel, while he may not consume alcoholic liquor while on duty.

Policemen, on duty, have the power of entry at any time.

Sweden

In Sweden the existing hygiene regulations for eating establishments date from 1919. They are at present under revision, as a new food law is at present under consideration by the Swedish Parliament.

Denmark

In Denmark there are apparently no special regulations regarding hygiene in eating establishments, although local food authorities have power to issue orders under the authority of the Foods Act, April 28th, 1950.

Training of Food Handlers in the U.S.A.

The training of food handlers commenced in the United States about 1936 in the State of Texas, being followed shortly afterwards by a scheme in New Mexico. Before the outbreak of war in 1939, food training schemes were in operation in a considerable number of places in the United States.

The U.S. Public Health Service, as part of an attempt to standardize these schemes, published "A Guide to Safe Food Service." The authors, John Andrews and Frances T. Champion, are on the staff of the Public Health Service. They have produced an excellent training manual for food handlers, which deserves to be widely read in Europe. It was first published in February, 1946.

Generally, the training courses are organized by State or City Health Services, but occasionally by private companies. It is the object of the courses to train as many food employees as possible. It is recommended that classes should not exceed fifty persons, but even this seems too large for practical instruction. Most instructors would probably prefer to demonstrate to thirty or fewer people. It is suggested that courses should be held annually but "the frequency of refresher courses depends on:

(1) The labour rate turnover of workers.

(2) The total number of workers—there must be enough classes to give all a chance to attend.
(3) Staff are available for giving courses of instruction.
(4) Survey range of establishments to determine existing sanitary conditions and to provide yardsticks for measuring need for improvement."

It has been found in the United States that the best time for holding classes is between:

(*a*) 9.30 a.m.–11.30 a.m.,
(*b*) 2.30 p.m.–4.00 p.m., or
(*c*) 3.00 p.m.–4.30 p.m.

The classes usually run from one to two hours. Three meetings to one and a half hours each is usually adequate to cover the course. The lectures usually comprise a talk and demonstration or film. Each period usually ends with a discussion in which an attempt is made to repeat the important points of the lecture.

In the United States a good selection of films is available on loan for the instruction of food handlers. Film catalogues are obtainable from the Educational Screen, 64 East Lake Street, Chicago, Illinois, U.S.A.; Milk and Food Section, U.S. Public Health Service, Washington, D.C., U.S.A.

Seattle, Washington, has been in the forefront of food hygiene training programmes since 1945. Courses for food handlers have been organized by the Health Department. At the present time 24,000 food handlers a year are being trained in food hygiene in the Seattle area. The Washington State Department pays 65 per cent. of the cost of instruction.

CHAPTER XXI

THE FUTURE OF FOOD LEGISLATION IN THE UNITED KINGDOM

The quality and purity of food is controlled by two main factors:

(*a*) By statutory legislation.

(*b*) By food manufacturers, processors and handlers.

Statutory legislation is largely based on the Food and Drugs Act, 1938. After the outbreak of war in 1939, however, further powers were obtained by the Defence (Sale of Food) Regulations. Unfortunately, the procedure was by no means the same under the Act and the Defence Regulations. Under the powers of the Defence Regulations only the officials of the Ministry of Food have power to act. As most of the work involved in the maintenance of high standards of food purity in this country devolve on the sanitary inspectors, it is greatly to be regretted that this duplication has been allowed to occur. The duplication of officials does not normally make for efficiency, happy relationships or co-operation. It is obvious that it would be better if the enforcement of all food standards were amalgamated under the powers of the sanitary inspectors.

A large number of certificates in regard to imported meat has been recognized by the Ministry of Food. These certificates are signed by an official who has the animals both ante-mortem and post-mortem. In view of the severity of the conditions imposed by the Public

Health (Imported Food) Regulations, 1937, particularly in regard to meat, it is surprising why the present slap-happy method of inspection for home-killed meat should be allowed to continue.

There is little doubt that the standard of food inspection by the Port Sanitary Authorities is higher with imported food than that exercised by the Local Sanitary Authorities in regard to home produced food.

Under the Public Health (Meat) Regulations, 1924, where a local authority can prove to the Minister that suitable arrangements for meat inspection have been made he can authorize under the Public Health (Meat) Regulations, 1924, a distinctive mark to indicate the identity of the local authority.

Apparently very few authorities were able to prove that their meat inspection was completely satisfactory. In fact, Chester is the only authority which has received permission to use a special mark. It would obviously be in everybody's interest that home-killed meat should be traced to its origin as easily and efficiently as imported meat. I therefore suggest that every killing centre should be allocated a special mark with an additional cipher, so that each meat inspector's work could be identified.

The low standard of quality in home-killed beef is now so well known among caterers that more and more buyers have been showing a decided preference for imported beef. Unless a real attempt is made to improve the type of cattle coming forward for slaughter, and also conditions in slaughterhouses, undoubtedly on a long-term basis, untold damage will be done to the home fat stock industry.

The standard of meat inspection at killing centres is,

to say the least, unfortunate. It is lower than it has ever been in my lifetime, and probably it is lower than it has been for a century. The important Ministry of Health Circular 62/Foods is now out of date and the most reasonable suggestions made for the guidance of meat inspectors are largely ignored. It is quite obvious that legislation in regard to T.B. meat needs radically overhauling and should be brought more into line with legislation in other civilized countries.

The Tuberculosis Order under the powers of the Diseases of Animals Acts was approved in 1938. This Order lays down obligations on " every person having in his possession or under his charge any cow which appears to be affected with tuberculosis." Unfortunately the Order has been a complete failure, mainly because the penalty clause for failure to report is so slight in comparison with the offence. A maximum penalty of £500 for a first offence and six months gaol, without the option, would go further in cleaning up our dairy herds than a great deal of talking. Until such time as people keeping tuberculous cattle are regarded by the man in the street as potential murderers, we are likely to continue to have diseased cattle.

Under the Meat (Addition of Preservative) Order, 1941, preservative in the form of sulphur dioxide may be added, while in Scotland, under the powers of Public Health (Preservatives in Food) Regulations, Scotland, sulphur dioxide may be added to minced butchers' meat to a maximum of 450 parts per million. It is certainly time that these undesirable preservatives should be declared completely illegal in meat.

During the war the number of slaughterhouses was reduced from many thousands to 500. This central-

ized slaughtering has facilitated meat inspection and has reduced the cost of slaughter. Unfortunately, however, many of the slaughterhouses are unsatisfactory. Many local authorities have attempted to improve conditions in the slaughterhouses under their control. The Ministry of Health as in a similar way to sewage schemes, has been unco-operative. The purity of our rivers is, of course, far worse now than it was in the Middle Ages, despite the so-called improvements in public health.

The Milk and Dairies Regulations, 1949, gave increased powers to the Ministry of Agriculture and Fisheries to cancel the registration of dairy farmers and dairy farms. The Food and Drugs (Milk and Dairies) Act, 1944, gave additional powers to Medical Officers of Health to prevent the sale of infected milk.

Paragraph 20 of the Milk and Dairies Regulations, 1949, gives local Medical Officers of Health the right to prohibit the sale of diseased milk in their areas. The Chief Medical Officer of the Ministry of Health in the Report of the Ministry of Health for the year ended March 31st, 1950, Command Paper 8343, p. 150, says :

"It is important that
(*a*) A notice under Regulation 20 should not normally be served, when the grounds of suspicion relate to diseases of bovine origin, if it is known that the milk will be subjected to heat treatment before sale to the consumer."

Not all pasteurization is 100 per cent. efficient and in any case the idea of drinking T.B. milk, even if it has been pasteurized, is most unpleasant. The drinking

of undiluted milk in these circumstances would appear to be in the nature of a rather unwise gamble, at the present time, in this country.

The Food and Drugs Act, 1938, Section 14, prohibits the use of any premises for the manufacture of ice-cream unless it is registered with the local authority. It appears essential that registration should be extended to all catering establishments, and that licences should be granted only if the premises are suitable for the production of clean food. It is obvious at the present time that many cafés are operating, apparently within the letter of the present law, in a disgraceful condition.

So far as ice-cream manufacture is concerned, the small unhygienic trader has been largely overcome by the Heat Treatment Regulations. The new standard for ice-cream has just about put the tin hat on dirty ice-cream premises—a reform which has been long overdue. Ice-cream premises have been cleaned up and by a suitable registration of premises there appears to be no reason why dirty catering premises should not also be cleaned up.

The Heat Treatment Regulations appear to be having the effect of increasing the proportion of business done by the larger and more efficient manufacturers. The small manufacturer in unhygienic premises has been a menace to public health for far too long, and it is good news to know that the Heat Treatment Regulations have forced the trade with dirty premises and a dangerous product out of business.

A long-standing difficulty has been removed by the setting up of a standard for ice-cream under S.I. No. 13 of 1951. Ice-cream, as from March 1st, 1951, shall

contain not less than 5 per cent. fat, 10 per cent. sugar and $7\frac{1}{2}$ per cent. milk solids other than fat. Local authorities may compel the use of recording thermometers (S.I. No. 67 of 1951) as from March 1st, 1951. It is regretted, however, that the bacterial purity of not more than 200,000 bacteria per cubic centimetre, which is in force in Northern Ireland (S.R.O. Northern Ireland No. 73 of 1938) but has not been extended to the whole of the United Kingdom.

In a short time the ice-cream trade has been cleaned up solely as the result of these statutory orders and the efficiency of sanitary inspectors.

From the information which has been given regarding food hygiene, it must be realized that conditions in eating establishments in this country are lagging behind the rest of the civilized world. The recommendations of the Catering Trades Working Party will do little to remedy the position even if they are approved by Parliament.

There has been a golden opportunity to restore the good name of the words "restaurant" and "hotel." A properly authorized system of grading for eating establishments under "A," "B" and "C" system, where only the "A" grade establishments would be permitted to use the words "restaurant," "grill room" or "hotel," would have solved many problems in one answer. The condition of many so-called restaurants is to-day simply appalling, particularly in those parts of the establishment which are not normally seen by the customer. The hygienic arrangements in the majority of licensed houses and licensed clubs must be seen to be believed. The film "Another Case of Food Poisoning" illustrates only too well the typical

washing-up arrangements in licensed premises. The kitchen arrangements are seldom, if ever, shown to the public. I would seriously suggest to the Brewer's Society that the public should be admitted to the back of the house on request. The chain stores, Marks and Spencers and Woolworths, do it, but they can afford to as they set an amazingly high standard.

Personally, I have met a great many sanitary inspectors, and I have always found them to be most helpful. The person responsible for running an efficient establishment will always invite them round the place to see if they have any suggestions. No one is likely to do that, however, if they have anything to hide.

Gambling with the public health is far more serious than soliciting in the street, and yet the penalties for the latter offence are far more severe. Yet the present control of eating establishments in this country is vague in the extreme. The catering side of the Working Party has suggested that a licence should be granted automatically to every establishment which applies. A suggestion of that type must be regarded as an attempt to sabotage the whole system of registration as, of course, it would if adopted. It is a remarkable fact that many cafés are owned or managed by nationals of a continental power where the standard of hygiene is the worst in Europe. They come here with the full protection of the law to carry on in their slipshod ways. Unfortunately, the whole of the catering industry is getting a bad name because of the haphazard methods of the black sheep. The Catering Trade Working Party in paragraph 101 of their Report (1951) makes a rather half-hearted attempt to

give reasons why the grading of eating establishments should not be established by law. In particular, attention appears to be focused on border-line cases, and a tendency to stress structural defects rather than faulty methods. Structural defects are just as bad hygienically as faulty methods. It would appear that the Working Party failed to discover any valid reasons why eating establishments should not be graded according to their standards of hygiene.

The general standard of mineral water factories is particularly low. I have seen swarms of flies during the summer months in some of them, while apparently no real effort has been made to keep the places clean. It appears to me that the manufacturers are attempting to produce mineral water at such low prices that no real standard of hygiene is possible, bearing in mind the high cost of labour and material. Personally, I am prepared to drink very few brands of mineral water.

Model bye-laws in regard to fish fryers, issued by the Ministry of Health as a recommendation to local authorities, are very moderate in their proposals.

Every vessel or receptacle which contains wet fish must be " thoroughly cleansed " at least once every twenty-four hours. Swill bins must be provided for the disposal of fish refuse. The swill should be removed once every twenty-four hours. There must be adequate means of ventilation. Every fish frying stove must be provided with side screens and a hood. The penalty for contravention of any bye-law of a local authority relating to these matters is, however, only £5.

In the catering trade and in industry the very high

level of taxation, both on distributed and undistributed profits, leaves very little for ploughing back. The whole question of the improvement of premises is to-day so much bound up with finance that little real hope of improved hygiene can be expected until the present excessive load of taxation has been considerably lightened.

BIBLIOGRAPHY

This Bibliography is an attempt to list the more important books and papers on food poisoning and its prevention.

Adams, H. S., "*A Program for the Instruction of Food Handlers.*" Department of Public Health, Flint, Michigan, U.S.A., 1942.

American Dietetic Association. "*A Guide to the Selection and Training of Food Service Employees.*" Pp. 47. Burgess Publishing Company, 426 South Street, Minneapolis 15, Minnesota, U.S.A., 1948. 4to.

Andrews, J., "*Methods of Sanitizing Eating and Drinking Utensils.*" U.S. Public Health Service, 1944.

Andrews and Champion, "*Guide to Safe Food Service.*" A Manual for use in organizing and conducting classes for Food Establishments Employees. Pp. 65. U.S. Public Health Service, Washington D.C., U.S.A., 1946. 8vo. Wrappers.

Anglo-American Council on Productivity. "*Meat Packaging and Processing.*" Report of a visit to the U.S.A. in 1950 of a Productivity Team representing the Meat Packaging and Processing Industry. Pp. 72. Anglo-American Council, 1951. 4to. Wrappers.

Anthony, D. J., and Blois, W. G. T., "*The Meat Industry,*" 1931

Barton, A. L., "*Dairy Law—Sum and Substance.*" Pp. 196. Pub. 7*s.* 6*d.* 1951.

Bath, Francis Raleigh, "*The Law of Master and Servant.*" 4th Edition. Pub. 30*s.*, Pitman, 1950.

Baumgartner, J. C., "*Canned Foods. An Introduction to Microbiology.*" Pub. 12*s.* 6*d.*, J. & A. Churchill Ltd. 2nd Edition, 1946.

Belam, Francis Arthur, "*Food Hygiene—A Joint Approach,*" Health Education Journal, Vol. VI, 1948, p. 33.

Benmeyer, Berl, "*Sanitation for Food Handlers.*" Pp. 128. With illustrations by A. Feigl. American Institute of Sanitary Science, Los Angeles, U.S.A., 1946. 4to. Wrappers.

Binstead, Raymond H., "*Pickle and Sauce Making.*" Pp. 128. Pub. 25*s.*, 1949.

Blacklock, D. B., "*A Guide to Human Parasitology for Medical Practitioners,*" 1938.

Blake, Ernest C., "*Protection of Buildings Against Vermin,*" 1926.

British Aluminium Co. Ltd., "*Aluminium and Food,*" 1931.

British Museum (Natural History) Economic Series No. 3.

" *Fleas as a Menace to Man and Domestic Animals. Their Life-history, Habits and Control*," 1949.

Bryan, J. M., " *Aluminium and Aluminium Alloys in the Food Industry—with special reference to Corrosion and its Prevention*," 1948.

Buckbinder, Buck, Phelps, Stone and Tiedeman, " *Investigations of the Swab Rinse Technique for Examining Eating and Drinking Utensils*," American Journal of Public Health, Vol. XXXVII, April, 1947, pp. 373–8.

Buxton, Patrick A., " *The Louse. An Account of the Lice which Infest Man, their Medical Importance and Control*," 1947.

Cameron, " *Parasites of Man in Temperate Climates*," 1946.

Central Council for Health Education, " *The Food and Drink Infections*." Report of a Conference held in London, 1947. Pp. 62. Pub. 4*s*., Central Council for Health Education, 1948.

Chandler, A. C., " *Introduction to Parasitology with Special Reference to the Parasites of Man*." New York, 1944.

Claremont, C. Leopold, " *A Practical Handbook of Rat Destruction*," 1926.

Clayson, D. H. F., and Chater, C. W., " *The Cleaning of Plant and Utensils in the Dairy Industry*." Journal of the Royal Sanitary Institute, Sept., 1948, Vol. LXVIII, No. 5, pp. 562–70.

Clegg and Sherwood, " *Bacteriological Examination of Molluscan Shellfish*," Journal of Hygiene, Vol. XLV, No. 4, Dec., 1947.

Cooper, A. M., " *How to Supervise People*." McGraw-Hill Book Co., New York, 1941.

Coppock, J. C. M., " *Hygiene and Food Manufacture—The Baking Industry*," Journal of the Royal Sanitary Institute, Vol. LXX, No. 4, July, 1950, pp. 387–91.

Corbett and Tams, " *Insect Pests*." H.M. Stationery Office, 1944.

Cox, Henry Edward, " *The Chemical Analysis of Food. A Practical Treatise on the Examination of Foodstuffs and the Detection of Adulterants*." 4th Edition, 39 illustrations. Pp. 340. Pub. 28*s*., J. & A. Churchill, 104 Gloucester Place, London, W.1. Red cloth 8vo, 1950.

Cruickshank, C., " *Food Hygiene in Shops and Restaurants*," The Practitioner, Vol. CLXII, No. 972, June, 1949, p. 461.

Dack, G. M., Ph.D., M.D., " *Problems and Errors in Assigning Problems of Bacterial Food Poisoning*," American Journal of Public Health, Vol. XXXVII, April, 1947, pp. 360–4.

Dack, G. M., Ph.D., M.D., " *Food Poisoning*." Revised edition. Pp. 184. University of Chicago Press, 1949, 8vo, brown cloth. 1st edition, 1943.

Daniel, R. J., " *A Guide to Marketable Fish*," 1949.

Darling, George, "*The Politics of Food.*" Pp. 211. George Routledge Ltd., 1941. 8vo, grey cloth.

Davidson, Francis A., "*Bovine Tuberculosis and the Value of Routine Herd Inspection,*" 1938.

Davis, J. G., "*A Dictionary of Dairying,*" 1950.

Department of Scientific and Industrial Research, "*Pests of Grain,*" 1939.

Department of Scientific and Industrial Research, "*The Handling of Meat in Small Refrigerators.*" Pp. 4. Food Investigation Leaflet, No. 4. H.M. Stationery Office, 1951, 8vo. Wrappers.

Department of Scientific and Industrial Research, "*The Case of the Trawler's Fish.*" Food Investigation Leaflet No. 3, 1950.

Department of Scientific and Industrial Research, "*Torry Research Station Controlled Fish Smoking Kiln.*" Food Investigation Leaflet No. 10. 1950.

Dewberry, E. B., "*Food Poisoning. Its Nature, History and Causation. Measures for its Prevention and Control.*" 2nd Edition. Pub. 17*s.* 6*d.*, Leonard Hill Ltd., 17 Stratford Place, London, W.1, 1947.

Dixey, R. N., "*Tuberculin Tested Milk—A Study of Re-organisation for its Production,*" 1937.

Dixon, J. A., "*Centralised Slaughtering,*" 1940.

Dobson, Norman, "*The Relationship of Poultry Diseases to the Practitioner,*" 1933.

Dodgson, R. W., "*Report of Mussel Purification.*" Ministry of Agriculture and Fisheries. Fishery Investigation, Series 11. Vol. VIII, No. 1, 1928.

Duncum, N. J., "*Modern Meat Marketing.*" A Picture Guide to Dissection. Pp. 74. Practical Press, 1949. 8vo, blue cloth.

Eckles, C. H., Combs, W. B., and Macy, H., "*Milk and Milk Products.*" 4th Edition. Pp. 454. Pub. 42*s.* 6*d.*, 1951.

Economic Advisory Council, "*Report of the Committee on the Slaughtering of Livestock,*" 1933.

Edelman, Richard, "*Text-book of Meat Hygiene with special consideration of ante-mortem and post-mortem inspection of food producing animals.*" 1934 and 8th edition 1943.

Ehlers, Victor M., and Steel, Ernest W., "*Municipal and Rural Sanitation.*" Pp. 449. McGraw-Hill Book Co. Ltd., New York, 1943. 8vo, black cloth.

Emllen, J. T., "*Baltimore's Community Rat Control Problem,*" American Journal of Public Health, Vol. XXXVII, June, 1947, pp. 721–7.

Felsenfeld, D., and Young, M., "*A Study of Human Salmonellosis in North and South America*," American Journal of Tropical Medicine, Vol. XXIX, 1949.

Fishmongers Company, "*The Distinguishing Features of Fish.*" Pub. 12*s.* 6*d.* Pp. 96. Fishmongers Company, London, 1949. Blue boards, 4to.

Fitzgerald, "*Are Frozen Foods a Public Health Problem?*" American Journal of Public Health, Vol. XXXVII, June, 1949, pp. 695–701.

Food and Agriculture Organization of the United Nations, "*Preservation of Grain Storage.*" Pp. 174. Washington, U.S.A., 1948. Wrappers.

"*Food Standards* (*Ice Cream*) " *Order*, 1951. S.I. No. 13 of 1951.

"*Food and Drugs* (*Milk, Dairies and Artificial Cream*)" *Act*, 1950.

Francis, John, "*Control of Infection with the Bovine Tubercle Bacillus*," Lancet, Vol. CCLVIII, 7th January, 1950, pp. 35–9.

Freeman, J. A., and Turtle, E. E., "*Insect Pests of Food. The Control of Insects in Flour Mills.*" Issued by the Ministry of Food. Pub., 7*s.* 6*d.* H.M. Stationery Office, York House, Kingsway, London, W.C.2, 1947.

Frisby, B. R., "*Use of Detergents and Chemical Sterilizing Methods for Washing-up*," 1950.

Georgia Department of Vocational Education, "*Sanitation in Food Handling.*" Atlanta, Georgia, U.S.A., 1946.

Gerrard, Frank, "*Meat Technology.*" A Practical Handbook for Students and Butchers. Pub. 15*s.* Leonard Hill Ltd., 1945. 8vo, brown cloth.

Gerrard, Frank, "*Sausage and Small Goods Production.*" Pub. 15*s.* Leonard Hill Ltd., 1948. Brown cloth.

Gerrard, Frank, "*The Meat Products Industry.*" Journal of the Royal Sanitary Institute, July, 1950, Vol. LXX, No. 4.

Ginsberg, A., and Robertson, A., "*The Examination of Minced Meat*," Veterinary Record, Vol. LXI, 1949, p. 540.

Goldie, William, "*Laboratory Control of Milk Borne Diseases*," Journal of the Royal Sanitary Institute, October, 1946, Vol. LXVI, No. 5. Pp. 505–15.

Gordon, L., "*The Eradication of Bovine Tuberculosis*," 1933.

Grant, J., "*Salmonellosis*," Medical Officer, 1st July, 1950.

Greatorex, J. G., "*A Scientific Approach to Meat Inspection*," Journal of the Royal Sanitary Institute, Vol. LXX, No. 4, July, 1950, pp. 362–72.

Hampton, Jack, "*Factory Canteens and their Management in Great Britain.*" Pp. 126. Pub. 15*s.*, Leonard Hill Ltd., 1952, 8vo.

Hannah Dairy Research Institute, "*Its Origin and Work with a Description of the Buildings, Equipment and Farm Stock*," 1931.

Harvey, William Clunie and Hill, Henry, "*Milk Products*, 1937," 2nd Edition, 1948.

Harvey, William Clunie and Hill, Henry, "*Insect Pests*," 2nd Edition. 27 illustrations. Pp. 347. H. K. Lewis & Co. Ltd., 1947. 8vo, red cloth.

Harvey, William Clunie, and Hill, Henry, "*Milk : Production and Control*," 3rd Edition. Pp. 758. Pub. 57*s*. 6*d*. Leonard Hill Ltd., 1951. The 1st Edition is dated 1936, 2nd Edition 1946.

Hayhurst, H., "*Insect Pests in Stored Food Products*." Illustrated from photographs by H. Britten. Pp. 83. Chapman & Hall Ltd., 1940. 8vo, cloth.

Hepner, H. W., "Psychology Applied to Life and Work," Prentice Hall, New York, 1941.

Herrick, A. D., "*Food Regulations and Compliance*." Two volumes. Pub. $10, Revere Publishing Co., 32 Broadway, New York, 4.

Hill, Harry, "*Pasteurisation*." 2nd Edition. Pub. 21*s*., H. K. Lewis & Co. Ltd., 136 Gower Street, London, W.C.1, 1947.

Hinton, H. E., Corbet, A. S., and Tams, W. H. T., "*Papers prepared for the Ministry of Food on Insects Pests of Food*." H.M. Stationery Office, York House, Kingsway, London, W.C.2, 1944.

Hinton and Corbet, "*Common Insect Pests of Stored Foods Products. A Guide to their Identification*," 1949.

Howard, A. J., M.A., A.R.I.C., "*Canning Technology*." 113 illustrations. Pp. 304. Pub. 30*s*., J. & A. Churchill Ltd., 104 Gloucester Place, London, W.1.

Hughes, A. M., "*The Mites associated with Stored Food Products*." Ministry of Agriculture and Fisheries.

Hull, Thomas G., "*Diseases Transmitted from Animals to Man*," 1941.

Hunter (Mrs.), M.Sc., "*Domestic Pests—What they are, how to remove them*." Illustrated in the text. Pp. 235. John Bale, Sons & Curnow Ltd., 83–91 Great Tichfield Street, London, W.1. 8vo, green cloth.

Hussemann and Tanner, "*Relation of Certain Cooking Procedure to Staphylococcus Food Poisoning*," American Journal of Public Health, Vol. XXXVII, November, 1947, pp. 1407–14.

"*Hygiene in Catering Establishments*." Report of the Catering Trade Working Party. Pp. 50. H.M. Stationery Office, 1951, 8vo. Wrappers.

"*Ice Cream (Heat Treatment)*" Amendment Regulations, 1951. S.I. No. 67 of 1951.

Indiana State Board of Health, "*Food Handling and Public Health*," Indianapolis, Indiana, U.S.A., 1943.

International Tin Research and Development Council, "*Historic Tinned Foods Publication No.* 85," 1939.

Jackson, Elizabeth, "*The Caterers' Manual*," Production Publications, 1948.

Jenkins, J. Travis, "*The Fishes of the British Isles*," 1925.

Jensen, I. B., "*Meat and Meat Foods. Processing and Preserving from Meat Plant to Consumer*," 1949.

Jones, Osman, "*Canning Practice and Control by Osman Jones.*" 3rd Edition. Pub. 36*s.*, Chapman & Hall Ltd., 37 Essex Street, London, W.C.2, 1949.

Jones, Thomas G., "*The Unbroken Front.*" Ministry of Food 1916–44. Pp. 219. Everybodys Books Ltd., 4 Denmark Street, London, W.C.2, 1944. 8vo, blue cloth.

Kaiser, Clifford Allen, "*Group Feeding.*" 2nd Edition. Pp. 490. Pub. $7, McGraw-Hill, New York, 1946, 8vo.

Kelinfeld and Buckbinder, "*Dishwashing Practice and Effectiveness (Swab-Rinse Test) in a large City as revealed by a Survey of* 1,000 *Restaurants*," American Journal of Public Health, Vol. XXXVII, April, 1947, pp. 379–89.

Kelser, Raymond A., "*Manual of Veterinary Bacteriology*," 1933. Also 5th Edition 1948.

Laing, Frederick, "*The Cockroach. Its Life History and How to Deal with it*," 1946.

Laird, D. A., and Laird, E. C., "*The Technique of Handling People.*" McGraw-Hill Book Co., New York, 1943.

Large, E. C., "*The Advance of the Fungi*," London, 1940.

Leff, S., M.D., D.P.H., "*The Health of the People.*" Pp. 288. Victor Gollancz, London, 1950. 8vo, brown cloth.

Leighton, Gerald, "*The Principles and Practice of Meat Inspection.*" William Hodge & Co. Ltd., 86 Hatton Garden, London, 1927.

Line, E. C., "*The Science of Meat and Biology of Food Animals.*" Vol. I 10*s.*; Vol. II 7*s.* 6*d.* Meat Trades Journal Co. Ltd., 5 Charterhouse Square, London, W.C.1, 1931 and 1932.

Linton, R. G., "*Veterinary Hygiene*," 1934, and also 3rd Edition 1940.

Long and Hamilton, "*A Review of Induction and Discharge for Tuberculosis in the Army*," American Journal of Public Health, Vol. XXXVII, April, 1947, pp. 412–20.

Ludewig, Edwin, "*Food Sanitation Course.*" Lecture Notes, Pp. 48. The Department of Health, New York City, 1948.

McAllen and Howie, "*Milk Hygiene*," 1931.

McCance, B. A., and Ship, H. L., "*The Chemistry of Flesh Foods*

and their Losses in Cooking," Special Report Series No. 187. Medical Research Council, 1933.

Macewen, Hugh A., M.B., Ch.B., D.P.H., F.R.S.E., "*Food Inspection*" (revised and enlarged by B. M. Macewen). 5th Edition. Pp. 524. Blackie and Son Ltd., 1934. 8vo, brown cloth.

Mackintosh, J., "*Eradication of Tuberculosis from Cattle Herds*," 1932.

Mallman, De Koning and Zaikowski, "*Critical Study of Machine Dishwashing*," American Journal of Public Health, Vol. XXXVII, April, 1947, pp. 390–9.

Mallman, W. L., Zaikowski, L., Kabler, D., and De Koning, D., "*A Study of Mechanical Dish Washing*." Research Bulletin No. 1. Pp. 51. National Sanitation Foundation, Ann Arbor, Michigan, 1949.

Mallman, W. L., and Kabler, D., "*Studies on Dish Washing*." Research Bulletin No. 2. Pp. 48. National Sanitation Foundation, Ann Arbor, Michigan, U.S.A., 1949.

Mann, Dr. Bertram, "*Health Problems in the Disinfectation of Crockery and Cutlery in Civilian and Military Life*," Public Health, Vol. LXI, No. 5, February, 1948, p. 82.

Manton, S. M., and Hinton, H. E., "*Insect Pests of Food*." Pub. 2*s*. 6*d*., H.M. Stationery Office, 1945.

"*Manufacturing Meat Products Working Party*," Report. Pp. 48. Pub. 1*s*. 3*d*. H.M. Stationery Office, 1950. Brown paper wrappers.

Marsh, Arnold, "*Smoke. The Problem of Coal and the Atmosphere*." Pp. 306. Faber & Faber, 1947. 8vo, cloth.

Martin, R. A., "*Practical Food Inspection*": Vol. I, "*Meat Inspection*"; Vol. II, "*Fish, Poultry and Other Foods*." Pub. 18*s*. for each volume, H. K. Lewis & Co. Ltd., 136 Gower Street, London, W.C.1, 1947 and 1948.

Mattick, A. T. R., "*The Handling of Milk and Milk Products*." H.M. Stationery Office, York House, Kingsway, London, W.C.2, 1937.

Mattick, A. T. R., and Hoy, W. A., "*Bottle Washing and Bottle Washing Machines*." National Institute of Research in Dairying, University of Reading, Shinfield, Nr. Reading, 1937.

Miller, A. R., "*Meat Hygiene*," 1951.

Ministry of Agriculture and Fisheries, "*Report of Second Inter-Departmental Committee of the Grading and Marking of Beef*," 1932.

Ministry of Agriculture and Fisheries, "*Rats and Their Destruction*." Bulletin No. 30 of the Ministry of Agriculture and Fisheries. 7th Edition, pp. 18, 1946. 8vo. Wrappers.

Ministry of Agriculture and Fisheries, "*Retail Trade Names for Fish*," Fisheries Notice, No. 23, 1935.

Ministry of Agriculture and Fisheries, "*The Mites Associated with Stored Food Products*," 1948.

Ministry of Food, "*Infestation Control : Rats and Mice*," Pp. 36. H.M. Stationery Office, 1946. 8vo. Wrappers.

Ministry of Food, "*The Advertising Labelling and Composition of Food.*" Pp. 82. H.M. Stationery Office, 1949. 8vo. Wrappers.

Ministry of Food, "*Report of the Inter-departmental Committee*," Pp. 56. H.M. Stationery Office, 1951, 8vo.

Ministry of Health, "*Final Report of the Health of Munition Workers Committee* 1918." Command 9065.

Ministry of Health, "*Precautions Against the Spread of Alimentary Infections*," 1940. Circular 2198.

Mohler and Eichhorn (Editors), "*Textbook on Meat Hygiene.*" 8th Edition. Philadelphia, 1943.

Mortimer, "*Food Hygiene. Some Problems of the Future*," Journal of the Royal Sanitary Institute, January, 1947, pp. 56–60.

Munro, J. W., "*Report on a Survey of the Infestation of Grain by Insects*," 1940.

National Bureau of Standards, "*Washing, Cleaning and Polishing Materials*," Circular C.424, U.S. Government Printing Office, 1939.

National Research Council (U.S.A.), Division of Antropology and Psychology Committee on Food Habits, "*Problems of Changing Food Habits.*" To Professionals and Agencies gratis. The Council, 1943.

National Research Council (U.S.A.), "*The Nutrition of Industrial Workers.*" Second Report of the Committee on Nutrition of Industrial Workers, Food and Nutrition Board. Circular Series No. 123, September 1945. National Research Council, Washington, D.C., U.S.A.

Ostertag, R. V., "*Textbook of Meat Inspection* (*Ante Mortem and Post Mortem*), *including Veterinary Control of Meat and Meat Products.*" English Edition edited by T. Dunlop Young, translation by G. E. Marshall. Baillière, Tindall & Cox, 8 Henrietta Street, London, W.C.2, 1934.

Overstreet, H. A., "*Influencing Human Behaviour.*" The People's Institute Publishing Co., New York, 1935.

Overstreet, H. A., "*About Ourselves : Psychology for Normal People.*" W. N. Norton & Co., New York, 1927.

Page, John, "*Meat Supervision : Abattoirs, Handling and Transport*," 1951.

Palmquist, E. E., Williams, K., and Aldridge, F. F., "*Seattle's*

Public Health and Educational Departments co-operate in organising and conducting a Food Handler's Training Programme," American Journal of Public Health, Vol. XXXIX, 1949, p. 1163.

Parangothy, J. T., "*Rat Virus Enquiry Report.*" Institute Medical Research, Federated Malay States, 1939.

Parker, Milton E., "*Food Plant Sanitation.*" Pp. 434. Pub. $6, McGraw-Hill Book Co., New York, 1948, 8vo.

Parry, Morley, and Wentworth, Ronald, "*Cleaner Food and How to Get It.*" Pp. 16. Institute of Public Administration. Pub. 1*s.* London, 1950.

Parry, R. H., "*Health Education and the Promotion of Health*," Lancet, Vol. CCLVIII, 8th April, 1950, p. 679.

Part, A. F., and Robinson, N.B., "*Practical Catering.*" 2nd Edition. Pp. 112. Practical Press Ltd., London, no date (*circa* 1938). 8vo, blue cloth.

Pearce, A. S., "*Introduction to Parasiteology*," 1942.

Phelps, Earle B., "*Stream Sanitation with a Chapter on Stream Microbiology.*"

Pilcher, "*Current Trends in Nutrition Research in Canned Foods*," American Journal of Public Health, Vol. XXXVII, June, 1947, pp. 702–8.

Poultney, S. V., "*Vinegar Products.*" Pp. 126. Pub. 12*s.* 6*d.* 1949.

Prescott, Winslow and McCrady, "*Water Bacteriology.*"

Ramsbottom, J., "*Edible Fungi.*" King Penguin Books.

Ramsbottom, J., "*Poisonous Fungi.*" King Penguin Books.

Ramsbottom, J., "*The Larger British Fungi*," 1923.

Ramsbottom, J., "*The Problem of Drink as Affecting Workers Under Heat Conditions*," Research and Progress, Vol. VII, 4.S.178, 1941.

"*Report of the Manufacturing Meat Products Working Party.*" Pp. 48. Pub. 1*s.* 3*d.*, H.M. Stationery Office, 1950. Brown paper wrappers.

Rhodes, A. F. Parker, "*Fungi Friends and Foes.*" Pp. 140. Paul Elen Publishers Ltd., London, 1950. 8vo, brown cloth.

Riley, William, "*Rodents in Relation to Disease and their Control*," *The Hygiene of Catering Establishments*, Journal of the Royal Army Medical Corps, Vol. XCII, No. 6, June, 1949, p. 274.

Ritchie, J. N., "*Bovine Tuberculosis*," Journal of the Royal Sanitary Institute, Vol. LXVIII, No. 5, September, 1948, pp. 503–8.

Robinson, A. C., "*Food Handling and Inspection Manual.*" Washington State Department of Health, Seattle, Washington, U.S.A., 1944.

Robinson, R. A., "*Bell's Sale of Food and Drugs.*" Butterworth

and Co. (Publishers) Ltd., Bell Yard, Temple Bar, London, W.C.2, 1947. 8vo, red cloth.

Rolfe, R. T., and F. N., "*The Romance of the Fungus World.*" Chapman & Hall, 1937.

Rolleston, H., "*Aspects of Age, Life and Disease.*" London, 1928.

Rond, "*An Epidemic of Mild Gastroenteritis of Unknown Etology Presumably Caused by Contaminated Utensils,*" American Journal of Public Health, Vol. XXXVII, November, 1947, pp. 1402–6.

Savage, Sir W., "*Practical Public Health Problems.*"

Savage, W. G., "*Food and the Public Health,*" 1919.

Schell, E. H., "*The Technique of Executive Control,*" 6th Edition. McGraw-Hill Book Co., New York, 1946.

Shorte, W. M., "*Food Control,*" Journal of the Royal Sanitary Institute, Vol. LXX, January, 1951, pp. 39–43.

Shrader, J. H., "*Food Control—Its Public Health Aspect.*" John Wiley & Sons, New York, 1939.

Smart, John, "*Handbook for the Identification of Insects of Medical Importance,*" 1943.

Smith, E. E., "*Aluminium Compounds in Food,*" 1928.

Spira, Leo, "*The Clinical Aspect of Chronic Poisoning by Aluminium and Its Alloys,*" 1933.

Stewart, Andrew M., "*Hygiene of the Preparation, Storage and Distribution,*" Transactions of the Royal Sanitary Association of Scotland, 1946, p. 50.

Swift, "*Food and Drugs Administration.*" Pub. 40*s.* by Butterworth, 1947.

Syme, John D., "*Fish and Fish Inspection.*" Pp. 162. Pub. 18*s.*, H. K. Lewis, London, 1949. 8vo, blue cloth.

Syme, John D., "*Some Aspects of the Fishing Industry.*" The Sanitarian. Vol. LXVIII, p. 150, 1949.

Tanner, Fred. Wilbur, "*The Microbiology of Foods.*" F. N. Garrand Press, Champaign, Illinois, U.S.A., 1944.

Texas State Department of Health, "*Food Handling and Public Health.*" Austin, Texas, U.S.A.

Thornton, Horace, "*The Present Position Regarding Food Inspection in England and Wales,*" Veterinary Record, Vol. LX, 1948, p. 594.

Thornton, Horace, "*Textbook of Meat Inspection. Including the Inspection of Rabbits, Poultry and Fish.*" Pub. 50*s.*, Baillière, Tindall & Cox, 7 and 8 Henrietta Street, London, W.C.2, 1949.

"*Training for the Catering Industry,*" Pp. 12. H.M. Stationery Office. 1946. 8vo, green wrappers.

Tressler, Donald K., Ph.D., and Evers, Clifford, F., B.Sc.,

" *The Freezing Preservation of Foods.*" Pp. 932. 2nd Edition. Ave Publishing Co. Ltd., New York. 1947. 8vo, green cloth.

United States Department of Commerce, " *Establishing and Operating a Restaurant.*" Industrial Series No. 39. U.S. Government Printing Office, Washington, 25, D.C., U.S.A. 1946.

United States Public Health Bulletin No. 280, " *Ordinance and Code Regulating Eating and Drinking Establishments.*" Recommended by the United States Public Health Service, 1943.

United States Public Health Bulletin, No. 295, " *Manual of Recommended Practice for Sanitary Control of the Shellfish Industry,*" 1946.

Vernon, H. M., " *The Health and Efficiency of Munition Workers.*" Pp. 138. Oxford University Press, 1940. 8vo, brown cloth.

Wakefield, Miss E. M., " *Edible and Poisonous Fungi.*" Bulletin No. 23, Ministry of Agriculture and Fisheries. Plates 24, 4th Edition. H.M. Stationery Office, 1939.

Walker, A. H., " *The Inspection of Fish, Poultry, Game, Fruit, Nuts and Vegetables.*" Meat Trades Journal Co. Ltd., 5 Charterhouse Square, London; W.C.1, 1930. 8vo, blue cloth.

Walters, A. H., " *Hygiene in Communal Feeding,*" Journal of the Royal Sanitary Institute, Vol. LXX, No. 6, pp. 657–65.

Walters, A. H., "*Catering Utensils. Hygiene and Routine.*" Medical Press, Vol. CCXXIII (1950), p. 202.

West, B. B., and Wood, L., " *Food Service in Institutions.*" 2nd Edition. Pp. 599. Wiley, New York, 1946. 8vo, red cloth.

West, T. F., and Campbell, G. A., " *D.D.T. and Newer Persistent Insecticides.*" 2nd Edition revised. Pp. 632, plates 12. Pub. 50*s.*, Chapman & Hall Ltd., 1950. 8vo, black cloth.

Whyte, William Foote, " *Human Relations in the Restaurants Industry.*" Pp. 378. Pub. $5, McGraw-Hill, New York, 1948.

Williams, G. W. Monier, " *Antimony in Enamelled Hollow-Ware,*" 1934.

Williams, G. W. Monier, " *Aluminium in Food,*" 1935.

Williams, G. W. Monier, " *Lead in Food,*" 1938.

Wilson, G. S., " *The Pasteurization of Milk.*" Pub. 18*s.* Edward Arnold & Co. Ltd., 41 and 43 Maddox Street, London, W.1. 1942.

Worshipful Company of Fishmongers, " *Memorandum on the Principles and Standards employed in the Bacteriological Control of Shellfish in the London Markets,*" 1951.

INDEX

Abattoirs, 39
Actinomycosis, 42
Agaricus Xanthodermus, 68
Age of animals, 10, 21
Aitchbone, 18
Allergy, 60
Amanita rubescens, 69
Amaranth, 116, 144
Anæmia, 42
Animal age, 10, 21
Anthrax, 43
Antimony, 109
A.N.T.U., 121
Argentine beef, 13, 14, 15
Arsenic, 108, 109, 120, 149
Artificial colouring, 64, 137
Aurine, 115
Aurantia, 115
Australian Meat Export Regulations, 15, 16
Avian tuberculosis, 47

Baby beef, 7
Bacillus coli, 41
Koch, 36
Bacon, 27, 135
Canadian, 31
curing, 30
quality, 27
storage, 30
uncooked, 30, 46
Bed bug, 79, 129
Beef (Australian qualities), 16
boneless, 18
chilled, 6, 14, 15
frozen, 15, 16, 17
grading, 6, 7, 8, 9, 10
prime, 6, 10
quality, 6, 10, 13
side of, 13
Benzoic acid, 145
" Black Leg," 43
" Black Quarter," 43
Black rat, 118
" Black Spot," 52, 73
Blatta orientalis, 128
" Blown can, 137
Body louse, 80, 129
Boiled crabs, 67
Boletus edulis, 69
Boneless beef, 18
Bone structure, 10, 11, 13, 22
taint, 54
Borax, 115
Boric acid, 115
Botulism, 100
Brawn, 135
Bread, 107
Brill, 62
Brine stain, 43
Brisket, 15, 18
Brisling, 138
Brown rat, 118
Bubonic plague, 124
Bull beef, 10, 12
Butter, 73, 135, 148

Cadmium, 110
Calcium salts, 95
Calf, 6, 19
Canadian bacon, 31
salmon, 147
Cancer, 29
Canned fish, 112
fruit and vegetables, 136, 137, 139, 145, 146, 150
meat, 58, 136
Canning, 101
Carcase grading, 9
Carcinoma, 29
Caseous lymphadenitis, 24
Catering licences, 143
Catfish, 62
Cattle prices, 7

Ceilings, 83, 133
Central slaughterhouse, 4, 8
Cheese, 53, 60, 112, 135, 148, 149
Cheviot sheep, 22
Chilled beef, 14, 15
China breakage, 94
Cholera, 2, 127
Chrysanthemum cinerariæfolium, 131
Chuck rib, 18
Cimex lectularius, 79
Cladosporium herbarum, 52, 73
Cleaners, 99
Cleaning equipment, 88
Clostridium botulinum, 100
teseri, 43
Coalfish, 62
Cockles, 65, 66
Cockroach, 76, 126, 129, 130
Cod, 61, 62
Coenurus cerebralis, 46
Colour index, 116
Colours in foodstuffs, 115
Cold sweets, 115
Communal towels, 77
Condensed milk, 138
Cooked meat, 4
Cooking fat, 73
Copper, 2, 108, 111
poisoning, 111
Cow beef, 10, 12, 13
Crab, 67, 138
louse, 80
Cream, 135
" Cream-filled " pastries, 106
" Crest," 12
Crested agaric, 69
" Crops," 15
" Cumberland " cut, 31
Cups, 93, 94, 159, 160, 161
Custard, 74
Cutlery, 113, 163
Cyanide, 113, 157
Cysticerus bovis, 46

Dab, 62
Dairy herds, 13
Dak, 119
Danish bacon, 31
Ministry of Agriculture, 31
D.D.T., 128, 129
" Dead man's flesh," 67
" Death Cap," 68
Decomposition, 9, 51
Decomposing fish, 60
meat, 51
Defrosting meat, 15
Dehydrated vegetables, 136
Dermatitis, 106
Detention officer (Scotland), 50
Detergents, 94
Diseased fish and meat, 4, 6
" Diseases of Animals " Act, 43
Dishwashing machines, 93, 98, 163
Distemper, 129
Dory, 62
Drains, 83, 88
Dried egg, 14
fruit, 75
peas, 111
Dropsy, 44
Dry cure, 30
sweeping, 159
" Dry Ice," 75
Duck eggs, 103, 140, 141
Dysentery, 127

Eggs, 60
Egg products, 135
Electric mincing machine, 90
mouse trap, 125
rat trap, 124
scrubbing machines, 91
Enamel jugs, 110
Enteritidis, 126, 141
Ephestia cautella, 76
clutella, 76
Kuchmilla, 76
Erythrosin, 116
Escallops, 65, 66

Faggots, 58
" Fair Average Quality," 16
Farcy, 44
Faxi bank fish, worms in, 64
Federal Insecticide Act, 121
Filaria bicolar, 64
Filter Passer virus, 27
Fish poisoning, 60, 135

Fisheries (Oysters, Crabs and Lobsters) Act, 1877...67, 68
Fish boxes, 65
fryers, 173
paste, 138
parasites, 64
poisoning, 60
Flies, 126, 129
Floors, 79, 83, 133, 155
Flounder, 62
Fluke, 23
Fluorescent lighting, 86
"Fluoride in Food" Order, 1947...114
Food allergy, 1
"Food and Drugs" Act, 20, 47, 85, 115, 132
Food Drug and Cosmetic Act, U.S.A., 152
Foot and mouth disease, 44
Forequarter, 12
Fore-rib, 18
Formaldehyde, 115
Freibank retort, 39
Freon, 70
Frozen beef, 14, 15, 16, 17
Frozen food, 147
mutton, 22
pork, 27
Fruit pulp, 117
Fumigation, 113
Fungi, poisonous, 68

Galantine, 135
Galvanized sinks and utensils, 110
Game, 53
Gammexane, 130
Garbage, 157, 160
Gelatine, 117
Gelt, 27
"Gid," 23
Gilt, 27
Gimmer, 21
Glanders, 44
Glasses, 97, 159, 160, 161
Glass containers, 73
Glucose, 140, 149
Gnawing marks from rats, 119
Goat flesh, 26
hair, 26
"Good Average Quality," 16
Gorgonzola, 53
Grading system, 9
Grade "A" milk, 39
Green colouring, 111
Guildford Hygienic Traders' Guild, 142
Guinea Green B., 116

Haddock, 61, 62
Hake, 62
Halibut, 62
Ham, 135
Hares, 53
Head louse, 80, 129
Health (Eating House) Regulations, N.Z., 1948...161
Heifer, 6
Herring, 138
Hind quarter, 11, 12
Hog, 27
Hogget, 21
Home canning, 101
Home-killed meat, 11, 167
mutton, 22
Horseflesh, 19, 20, 134, 135
Horseflesh Order (1941), 134
Horse mushrooms, 69
House flies, 129
mice, 124
Human flea, 81
Humidity, 71
Hydrogen peroxide, 115
Hypochlorite, 96

Ice cream, 5, 104, 133, 149, 170, 171
"Ice Cream (Heat Treatment)" Regulations, 1946...135, 170
Illegal slaughter, 21
Illumination, 160
Imported bacon, 31
lamb, 25
mutton, 25
Infantile paralysis, 127
Infected meat, 2
milk, 2
Infested food, 76

Insect pests, 76
International Conferences on Rats, 124
Irlam, 106
Iron, 114
Italian salami, 20

Jam, 117, 139, 140, 149, 150
Jaundice, 44
Jelly, 74, 149
Jersey carcase, 13, 45
cattle, 13
Johne's disease, 45

Kerosene, 129
Kid, 26
Killing out percentage, 7
Kippers, 63
Koch's bacillus, 28
Kosher butchers, 12

Lactarius deliciosus, 69
Lamb, 21
Lambs' tongues, 3
Lamp colours, 86
Lavatory facilities, 156
Lead, 108, 112
Lepiota procera, 69
rhacodes, 69
Leg of beef, 18
Leg of mutton piece, 18
Lemonade, 110
Lemon curd, 135
sole, 63
Lighting, 85, 155
Limburger cheese, 53
Ling, 63
Lipstick on cups, 93
Live animals, 8
Livestock (Sales) Order, 1949...7
Lobsters, 68, 138
Loch Maree botulism poisoning, 100
London sewers, 123
Lungs of sheep, 23
Lur grade, 31
Lymphatic glands, 33

Mackerel, 63
" Mackerel " backed, 22
Magnesium salts, 95
Malachite green, 116
Manchester yellow, 115
Manual workers, 60
washing methods, 97
Manufacturing meat, 4, 136
Manufactured Meat Products Working Party, 79, 82, 92
" Marbling," 10, 11, 12
Margarine, 73, 135
" Measly " beef, 46
pork, 29
Meat pies, 108
Meat (Addition of Preservative) Order, 168
cooling, 9
graders, 8, 9, 25
inspection, 9, 24, 33, 47
inspection in Scotland, 49
paste, 135, 137
pies, 103
roll, 135
setting, 9
Meat-slicing machine, 90
Mediterranean flour moth, 76
Merchandise Marks (Imported Food), No. 3 Order, 1934...31
Metallic poisoning, 108
Methyl chloride, 114
Mice, 103, 118
Mild-cured bacon, 30
Milk, 2, 38, 60, 74, 135
" Milk (Special Designations) " Order, 1926...39
" Milk and Dairies " Regulations 1949...169
Ministry of Food, 49
" Mineral Oil in Food " Order, 1949...142
Mineral water factories, 173
" Mothers," 141
Mould growths, 52, 72
Mucor mucedo, 52, 73
Multiceps multiceps, 22
Mushrooms, 69
Mussels, 66
Mutton, 21
fat, 22
frozen, 22
New Zealand, 23

Naphthol Yellow S., 116
Neck clod, 18
Nephritis, 45
New South Wales Food Act, 149
New York Health Department, 98
New Zealand, 14, 15, 16, 27, 161
Meat Producers' Board, 24
Nitro compounds, 115

Offal, 58
Offensive odours, 134
Old Age Pensioners, 5
Onchocerca gibsoni, 16
Overalls, 5
Ox, 6, 11, 12
Oysters, 65

Packing plants, 137
Paints, 126, 129
Paper sacks, 129
Parasites, 22
Parasite in beef (*Onchercerca gibsoni*), 16
Paratyphoid fever, 2
Partridge, 53
Pasteurella suisepica, 27
Pasteurization of milk, 56, 169
Pastries, 74
Pediculus humanus capitis, 80
corporis, 80
pubis, 80
Penicillium, 73
Pericarditis, 45
Petroleum-based detergents, 95
"Pharmacy and Poisons" Act, 120
Pheasants, 53
Phosphorus, 120
Phosphorescence, 55
Photobacterium sarcophilum, 55
Pickles, 117, 141
Picric acid, 115
Pilchard, 138
Pilferage, 77
"Pit," 15
Plaice, 63
Plague, 118
Plate racks, 94
scraping, 163
Pollack, 63
Polluted sea water, 67
water, 2
Ponceau red, 116, 144
Pork, 27, 60
(uncooked), danger of, 30, 46
Potassium permanganate, 115
Potatoes, 59
Potato machine, 89
Poultry, 47
Prawn, 138
Preiz-Nocard bacillus, 25
Preservatives, 116
Prime beef, 17
Proteus vulgaris, 52
Psalliota xanthoderma, 69
Public Health Act, 1875...132
"Public Health (Imported Food) Amendment" Regulations, 1948...25
"Public Health (Meat)" Regulations, 48, 167
"Public Health (Meat Inspection)" Regulations, Scotland, 49
"Public Health (Preservatives in Food)" Regulations, 31, 109, 111, 135
Public Health (Scotland) Act, 134
Puff balls, 69
Pulex irritans, 81
Purple agaric, 69
Putrefaction, 51, 53, 54
Pyrethrum, 131

Quality of meat, 6–32
Quarter ill, 43
Quick freezing of fish, 64
Quick-frozen fruit and vegetables, 136

Rabbits, 73, 106
Raisins, 117
Rats, 103, 118
Rat flea, 124
Raw meat, 6
"Red Squill," 120
Refrigeration, 70, 157
Refrigerating agent, 70
Rhubarb leaves, 1, 59
Rickets, 45

Rigor mortis, 9
Roll divider, 90
Roller towels, 77
Rosanlines, 116
Rosin, 116
Rotten fish, 53
Royal Commission on Tuberculosis, 41
Rubbish bins, 126
Rump, 18
Runways, 119

Saccharin, 149
Salami, 20
Salicylic acid, 115
Salmon, 138, 147
Salmonella aertrycke, 41
enteritiditis, 41, 103
poisoning, 102, 120
typimurium, 104, 141
Sandwiches, 91, 106
Sanitary conveniences, 89
Sardine, 138
Sausages, 117, 135
Scabies, 81
Scalping accidents, 78
School canteens, 3, 111
Seal meat, 53
Setting of meat, 9
Shearling, 21
Sheep, 21
Sheep's lungs, 23
Shell fish, 65
Shoulder clod, 19
Sild, 138
Silverside, 18
Sinks, 89, 161
Sirloin, 18
butt, 19
Skate, 63
Slaughterhouses, 168
Sleeping place, 133
" Slink " veal, 19
" Smear " marks, 119
Smithfield, 42, 47
Smoke generators, 130
Snail, 23
Soap, 95
Sodium arsenite, 121
fluoascetate, 122
Sodium fluoride, 114
silicate, 84
Soft furnishings, 128
Solanine, 59
Solder, 113
Sole, 63
Solid carbon dioxide, 75
Soups, 135
South American exporters, 14, 15
Sow, 27
Ships, 14
Spanish-American war, 126
Spencer roll, 19
Spices, 9
Spitting, 163
Sporotrichum carnis, 52, 73
Sprat, 138
Staff hygiene, 77
Stag, 6
Stainless steel, 88, 92
Staphylcoccus, 103
Steer, 6
Sticking, 18
Stilton, 53
Stirk, 6
Storage rooms, 86, 157
Store, 7
Storekeepers, 136
Strawberries, 137
Strychnine, 149
Sugar, 117
Sulphur dioxide, 14, 108, 140
Sulphurous acid, 115, 145
Sultanas, 117
" Sweating," 14
Sweeping, 161
Swill, 59
bins, 126, 173
Swine erysipelas, 27

T.B. cattle, 39
T.T. herds, 38
Tænia solium, 29
Tank cure, 30, 32
Tape worms, 2, 22, 29, 46
Tartrazine, 116, 145
Tea towels, 162
Temperature, 85
Thamnidium, 52, 73
Theave, 21

Thick flank, 18
Thin flank, 18
Three-quarter side, 31
Tin, 111, 114
Toadstools, 1
Toilet facilities, 155
Tomato ketchup, 141
Topside, 18
Toxins, 100
Training courses, 164
" Transfer of Functions " Order, 1948...132
Transport vehicles, 1, 2
Trichinella spiralis, 29
Trichinosis, 29
Tricholoma nudum, 69
Tuberculosis, 2, 9, 13, 14, 27, 35, 36, 56
" Tuberculosis " Order, 39, 168
Tuberculous cattle, 13
  cows, 13, 38
  meat, 9, 13, 14, 27, 38, 133
Tup, 21
Turbans, 78
Turbot, 63
Tusk, 63
Typhoid fever, 2, 127

Udder, 12, 13
Uncooked bacon, 30, 46
  pork, 30, 46
Undulant fever, 2
United States, 2, 17, 40, 46, 99, 106, 116, 152, 155, 164
United States Agriculture Marketing, 17
United States grading of meat, 17
United States Public Health Service, 154, 164
" Unclean " fish, 62
Unthrifty lambs, 21
Urginea maritima, 120
Utensils, 156

Veal, 19
  calf, 6
Venison, 53, 54
Ventilation, 87, 155, 161
Veterinary surgeon, 48
Victoria yellow, 115
Vinegar, 141

Walls, 82, 133, 155
" Warranty Defence," 6
Washing facilities, 77, 133
Water, 2, 156
" Water-pack," 139
Weevils, 131
Welfare facilities, 77
Wether, 21
Wheat, 131
Whelks, 65, 66
Whiskers, 73
" White Spot," 52, 73
Whiting, 63
" Wiltshire " side, 30
Wind-operated exhausters, 155
Windows, 126, 133
Wire gauze, 126
Witch, 63
Women's cloakrooms, 88
Wooden tables, 91
" Wooden Tongue," 42

Xenopsylla cheopsis, 124

Yellow fat, 13, 22

Zinc, 2, 108, 110
  baths, 111
  sulphide, 120.

CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE * MYSORE. * LIBRARY

23/6/82

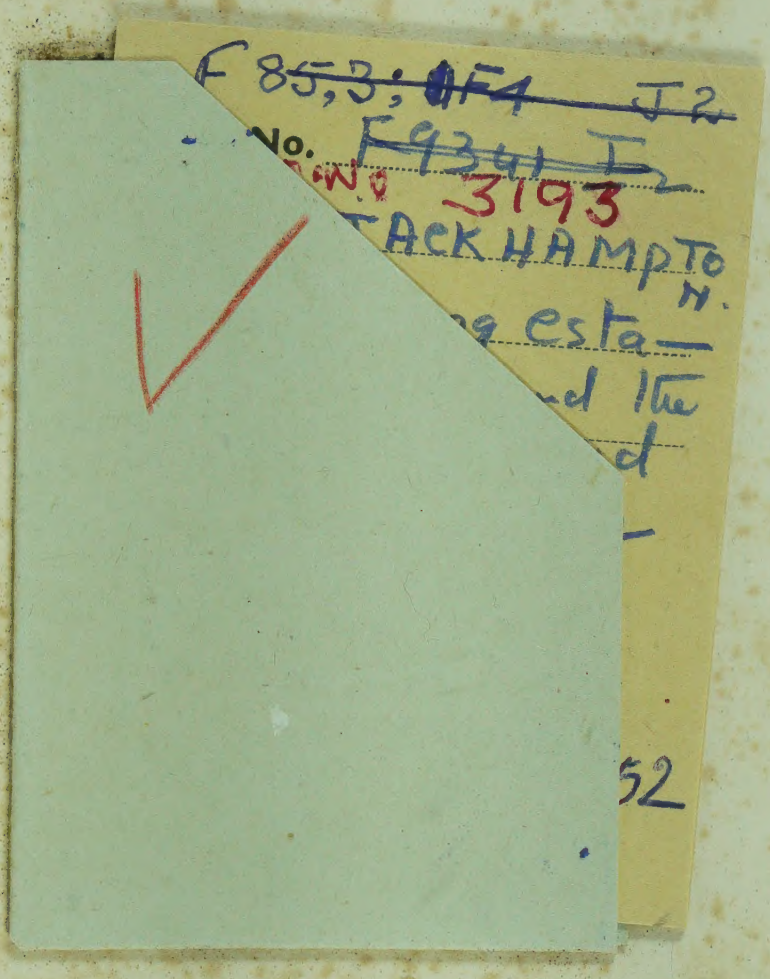
C. F. T. R. I. LIBRARY, MYSORE.

Acc. No. 3193

Call No. ~~F 85,3 ; #F4~~ J2
(X34, (F8,3) N52

Please return this publication on or before the last DUE DATE stamped below to avoid incurring overdue charges.

Due Date	Return Date	Due Date	Return Date	Due Date	Return Date
31.1.70	19/1/70				
11.7.75	11.7.75				
10/8/75	1/8				
12.11.93	15.11.93				


F 85,3; 1F4 J2
F934 I 2
No. 3193
TACK HAMPTON
esta
d the
d
52